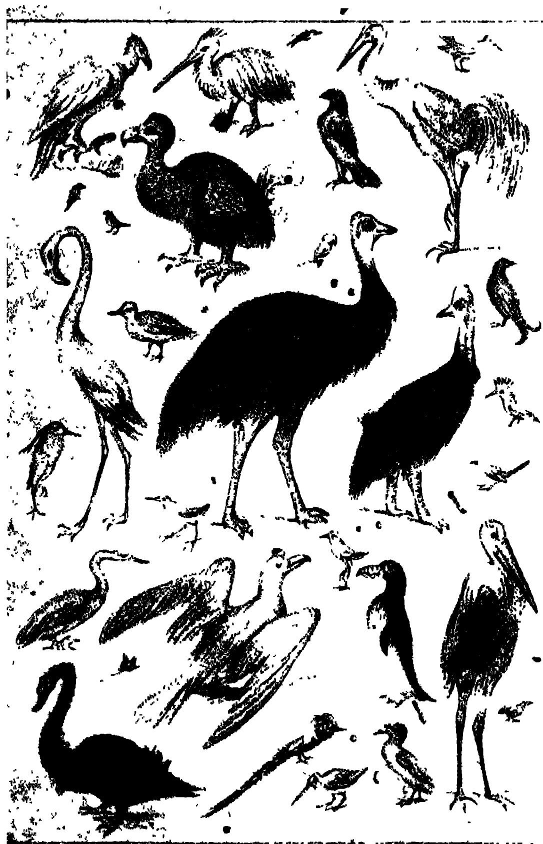


AN OUTLINE

OF THE

KINGDOMS OF NATURE,

FOR

THE USE OF SCHOOLS.

BEING

A CONCISE INTRODUCTION TO THE ANIMAL, VEGETABLE, MINERAL, AND GEOLOGICAL KINGDOMS.

With Plates,

AND QUESTIONS FOR EXAMINATION.

BY

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PREFACE.

This Work is intended to assist those Teachers and Schoolmasters who are in the habit of giving their pupils regular instruction in Natural History. No similar compendium, combining, as far as is compatible, scientific arrangement, with details calculated to interest the young mind, has previously been published. It is to meet a want which the author himself in a long course of experience has felt, and of which he has very often heard others complain. He would recommend that it should be used as a class-book or reader, and that its use should, whenever practicable, be accompanied by the exhibition of pictures of the objects described. It is so arranged that it may be conveniently used with the following prints, published by Darton and Clark.

Comparative Sizes of Quadrupeds—Two Sheets.
Ditto Birds.
Ditto Fishes.
Ditto Reptiles.

The Vegetable Kingdom—Six Sheets.

Agriculture—Three Sheets.

Mineralogy and Geology.

Sources of Food.

Sources of Manufacture.

A Series of Animals, on small sheets, some of which are by Landseer.

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BOOK I.

THE ANIMAL KINGDOM.

INTRODUCTORY REMARKS.

1. At the head of the Animal Kingdom is MAN, who possesses the *Will* to act, and the faculty called *Reason*, which enables him to judge whether what he does is *right* or *wrong*. 2. He is, therefore, to God an *accountable being*:—3. but the other members of the Animal Kingdom are supposed to possess only Memory and Instinct, and are, therefore, not held to be accountable beings.

4. The proper exercise of Reason makes us wise; and Wisdom is the very foundation of Religion, which teaches us our duty to God and Man.—5. Let us, therefore, most earnestly cherish the faculty of *Reason*,—that faculty which elevates us above "the beasts that perish," and gives us, through

the promises of the Gospel, the assurance of eternal life and happiness, if we love God, and obey his commandments.

6. Quadrupeds are, by their form, and the skins wherewith they are clothed, admirably fitted for living upon the earth. 7. The Feathered Tribe, which would otherwise be incommoded with the moisture of the atmosphere in which they fly, are enabled to spread a kind of animal oil over their feathers. 8. Fish, the inhabitants of the deep, are wonderfully adapted for the element in which they live: the apparatus which gives to a fish the means of *breathing* under water, is most marvellous, and exactly suited to its element, and there is an air bladder under the spine, by the dilation or compression of which the fish rises or descends,—they move about rapidly in all directions by means of the tail and fins, the former serving to *steer*, and the latter to propel them. 9. There are some animals called *Amphibia,* that live equally well in the water as on the land. Many of the *Reptiles* belong to this class, such as the Alligator and Crocodile, and they have generally cold blood.

1. Who stands first in the animal kingdom, and with what faculties is he endowed?

2. To whom is he accountable?

3. What do the other members possess, and are they accountable?

4. How does reason raise mankind?

5. What are the Gospel promises to those who make a proper use of reason?

6. What is to be remarked on quadrupeds or four-footed animals?

7. What is to be remarked on the feathered tribe?

8. Describe the movements of the fish.

9. What are called amphibia?

QUADRUPEDS.

THE LION.

1. The lion, as it respects comparative size, holds a rank next above the tiger: its length is about six feet — nine, including the tail; and the height varies from three feet and a half to five feet. There is much hair about the head, and a thick mane falls over the neck: the colour is usually a pale tawny, whiter underneath.

2. This animal is usually designated the "king" of quadrupeds, and in point of figure and personal aspect, it is well worthy of the distinction; but it is, at the same time, certain that its disposition is by no means so noble and disinterested as has been frequently described. 3. It is, however, much less cruel than the tiger, and has never been known to mangle its prey after having satisfied the cravings of appetite. We shall return to this subject when speaking of the *habits* of the animal.

4. The lioness is one-fourth smaller than the

lion, and is of comparatively insignificant appearance, for she has no mane. 5. About the spring of the year she produces her young, four or five in number, which resemble small pug-dogs. 6. During twelve months they are nourished by the milk of the mother, but are, at the same time, occasionally supplied with prey, and taught to suck the blood and lacerate the flesh. In acts of maternal fondness, no animal exceeds the lioness; and she becomes quite as daring and more ferocious than the male in defence of her offspring. She is very careful to conceal the place in which she deposits her young, and when distrustful, will remove them, *covering her footsteps with leaves*, to prevent pursuit. 7. Robbed, she becomes perfectly infuriate; rushes madly through the woods, careless of all obstacles, and she has been known to follow her despoilers for some distance out to sea.

8. Few sounds can be imagined more terrible than the roaring of the lion when in quest of prey, and he then spares no animal whatever, devouring as much as will suffice him about two days; after which, he retires to his den. His teeth are so strong, that they enable him to break up the bones of most animals with facility, and his tongue is rough and prickly. 9. It is an error to suppose that the lion does not hunt by the scent:

but the fact is, that that organ is somewhat feeble, and therefore he makes use, principally, of the *eye*.

10. Mungo Park, the celebrated African traveller, aware of this fact, had recourse to the following stratagem :—

In passing through the desert he perceived an immense lion crouching on the sand, his mouth upon his paws, and his eyes nearly closed beneath the burning sun of mid-day; although in a state of trepidation, he did not lose his presence of mind, but turning aside, he got behind the bushes in the rear of the savage, and fortunately escaped.

11. The strength of this animal is tremendous—a stroke of his paw will break the back of a horse, and the sweep of his tail will bring a strong man to the ground; so that his prey is generally killed before he begins to devour it. 12. In attacking the buffalo, the lion has to contend with a formidable assailant, and therefore he makes use of stratagem as well as force, seizing upon the mouth and nostrils, and squeezing them until his foe expires from strangulation, he then, with surprising sagacity, takes out the entrails, so as to diminish his burthen, and carries off the remainder of the carcase. 13. Although the lion will dare all things for food, he is not naturally courageous: there

is, in truth, a mixture of pride and cowardice about him, as may be inferred, from the fact of his not making a second attempt upon prey which he may happen to miss at the first spring.

14. The lions of the Cape prefer the flesh of the Hottentot inhabitants to any other: and an instance is on record of a lion that darted through a herd of cattle upon the Hottentot who drove them; but the latter contrived to scramble up one of the tree-aloes, wherein the immense *umbrella-like* nest of a kind of small bird* had been built. During his ascent the animal sprang at, but missed him, and then sullenly walked around the tree. After about an hour the Hottentot ventured to peep beyond the edge of the nest, when, to his horror, he beheld his enemy still near, crouched, and glaring upon him. Matters remained thus for twenty-four hours, after which the lion, being parched with thirst, made the best of his way to a distant spring, and the Hottentot descending, reached his hut, about a mile off, in safety.

It was discovered that the beast had returned to the tree, and had afterwards hunted, by the scent, to within a short distance of the hut.

15. Both the Negro and Arab chiefs, in Africa,

* Of the genus *Loxia*.

exhibit surprising skill and courage in subduing this formidable beast of prey. They attack him with spears, and, when his rage is at the highest, spring upon his back, and, with a short sword, pierce his heart. If once acquainted with the superiority of man, the animal becomes cowed into the most perfect submission. 16. That the lion is capable of very remarkable attachment, there can exist no doubt; but in this respect there is not any very great difference between it and the tiger, leopard, and other animals, although he is, probably, less capricious. Nevertheless, the lion is also what Dr. Johnson called "a good *hater*," as the following event of very recent occurrence will prove. M. Martin, who a few years ago, was so famous for the command which he possessed over wild beasts, and who exhibited at the principal theatres in Europe, has, for some time past, lived in retirement, at the village of Gondo, near Rotterdam; but desiring once more to see the animals of the Brussels menagerie, which had formerly been under his care, he went in amongst the crowd of spectators, and when feeding-time arrived, *coughed*, as had been his usual signal. Instantly, all the animals left their food, and began to gambol about the cages with a thousand joyous antics, and when he entered among them, their delight appeared enthusiastic,

save only, in the case of the lion Nero, by which Martin had been wounded; he alone remained sullenly in a corner, growling, and just as Martin left the den, sprang at him, but fortunately missed him. His cloak, however, was torn to pieces. In contrast with this, a keeper, of the name of Cassel, at Paris, who had brought over, and had the care of, a lion and lioness, was taken ill, and the animals, particularly the male, were thrown into a state of sullen despair, in consequence. They refused the food given them by the new keeper, and even menaced him, so as to prevent his approach. Cassell recovered, and it is difficult to imagine the joy of the male—indeed of both—in having him once more as their keeper; but the lion carried it so far as even to appear jealous of the lioness's sharing his attention!

17. At the Cape of Good Hope, the lion is usually taken by means of pit-falls. It is at full growth at the age of five years, but has been known to live upwards of seventy. The quantity of raw meat consumed by the animal, when in a state of confinement, amounts to about six pounds daily for the male, and half that quantity for the female.

It was supposed that the *dog* was the *only* animal they permitted to live with them on terms of familiarity; but this is a mistake, as the surprising exhibitions of Van Amburgh, and

Mr. Carter, undeniably prove. Recent observation seems to confirm that the lion is, at times, as capricious as the tiger.

18. In some parts of Africa, and in India, *lion-hunting* is a favourite sport. It is also a very dangerous one, as the following letter from Lieutenant Clarke, of the 26th Native Infantry, Bombay, will prove. He says :—

"In June, 1833, I set out from Cutch to join my regiment, then lying at Deesa. On the night of the 22nd my tent was pitched about 20 miles from a village called Ghousnard, on the banks of the river Burnasse. I travelled with a double set of servants, camels, &c., and by keeping one set constantly in advance, I had nothing to do but ride from tent to tent, every thing being prepared for my reception. Devotedly fond of field-sports, I had pursued them with the utmost avidity since my first arrival in India. The country I was now travelling through abounded in game, particularly hog and black buck.

"Early on the morning of the 23rd I traversed the distance from where I had slept to my tent near Ghousnard, on a Hirkara camel; and having partaken of a capital breakfast, I eagerly interrogated my Shikaree (servant) as to what prospect of sport. He told me 'there was plenty of hog.' I gave immediate directions to get out the horses,

and was soon mounted on a favourite Arab, that had been at the death of as many hogs as any horse in India, my Chaluck Sewar (servant) riding my second horse, with a spare spear; a Syce (servant) leading a third; and another with my rifle: these, with 14 coolies or beaters, completed the party. It was an undulating country, and interspersed over it were numerous small covers of tamarisk, &c. At this time of the year there were no signs of cultivation. We had beaten a considerable quantity of ground without success, moving only a few pigs that were too small to ride after; and my patience and good humour were rapidly evaporating, when my Shikaree pointed out the track of a large boar; it appeared quite fresh, and I determined to follow it. We proceeded for above a mile, every moment in the hope of rousing him; when turning the angle of a small cover we suddenly came upon a dead bullock; about 20 yards to the right of it was another; and not 100 in advance was the hog. The coolies collected round it, and I heard them repeating the words 'Lions, lions!'

"Enraged at my being baffled of my expected sport, and my blood up, I dismounted, and my Shikaree showed me the lions' track. We could make out distinctly that there were six; and as it is their habit to return at night and devour their

prey, I made no doubt that they were still in the immediate neighbourhood. I seized my rifle, and after considerable remonstrance, and with some difficulty, I persuaded my coolies to follow them up, and taking the lead, we tracked them into a tamarisk nullah or ravine, running at right angles and into the bed of the river. The tamarisk resembles the cypress, and is about the height of a man's head, forming a very thick cover, extending over four or five acres. After a short pause we entered, not knowing but that the next step might throw us into the lions' jaws. We, however, beat through without any adventure, and then we discovered they had stolen away, five taking down the bed of the river: the other, which by the track appeared a very large one, had doubled back into cover, broke higher, and made up along the bed of the river Burnasse. This last I determined upon following. We soon tracked it into a small jungle on the edge of the river. I had just entered when I heard a shout, and running round a bush that intercepted my view, I saw an enormous lioness making off with tremendous bounds; I fired and missed her. I shouted to my sewar to keep her in sight. He put his horse to speed, and in a short time returned and told me she had taken refuge in a large brake. He guided me to the spot, and I

got within 30 yards; she was crouched, glaring on us as we approached. I raised my rifle and fired—she uttered a tremendous roar and rushed out—I had wounded her in the shoulder, for as she crossed the bed of the river she went on three legs. My sewar again followed, but she turned on and pursued him, roaring terribly. He, however, found no difficulty in getting away; and she retreated and took her stand under a single tree, much resembling our thorn, but larger, and called here a bauble-tree.

"There she stood in full view, appearing almost as large as a bullock, with her tongue out, lashing her sides with her tail, and roaring most appallingly. I now sent back all my followers, and, cocking my rifle, steadily approached till within 30 yards, when I gave her my fire. I struck her, I believe, in the belly. When she received my shot, she lowered her head and rushed towards me as if mortally wounded; but suddenly, when within ten paces, turned off and again made down the bed of the river for a short distance, then crossed to the opposite bank, and entered a large jungle.

"The natives crowded round me and assured me she had received her death-blow. I was greatly elated—thought her a cowardly, skulking beast—and imagined I had nothing to do but

take possession of my prize. I quickly reloaded, and though the sun was at its meridian, and the heat intense, I still pursued on foot. We now entered the jungle into which we had marked her; it was so thick I could hardly see a yard before me. I walked for some time without success, at length one of the coolies exclaimed, 'Sahib! Sahib! hush, hush, do you not hear anything?' There was a dead silence for a moment, and then I distinctly heard the panting of some huge beast near me. I looked earnestly in the direction, but still could not see anything. By this time all the coolies had decamped, leaving me alone with my shikaree. 'There, Sahib! there in that bush.' I now caught sight of her sitting up like a dog, with her tongue out and glaring on us. I raised my rifle, but my hand shook so from the excitement and extreme heat and exertion, that I felt certain I should miss. I lowered it, and turning to my shikaree told him he must shoot her. He was a capital shot: I have seen him break a bottle at a hundred yards with a ball. 'No, no, Sahib, me not shoot, me afraid me not hit him.' I threatened to shoot him if he hesitated, putting the rifle into his hands; and in order to give him confidence, I advanced forward a little to his left. He fired and missed, threw down the rifle and fled. The moment the enraged beast heard the

report, she rushed out. For a second I paused—then turned and ran for life. It was a heavy sand, and I had on spurs and gaiters; I could not have run far, before I heard her roaring tremendously, close behind. I cast a look back—she was within a few yards. I attempted to dodge: my courage died away—my legs failed me. She sprang, and dashed me to the earth. The first blow must have been certain death, but her leg being broken she could not strike. She seized me by the lower part of the back, shaking me as a cat would a mouse, lacerating and tearing me dreadfully: then threw me to the ground on my face. She now caught me by the left arm, mumbling and biting it; the agony was so intense that I threw up my right arm, and caught her by the ear. She quitted her hold and seized my wrist. I inwardly prayed for death to relieve me. Apparently exhausted, she now crouched at full length, one leg resting on my right thigh, the other a little drawn back between my legs; her tongue out, panting like a tired hound, glaring on me full in the face. I had some indistinct feeling at the time that my eye might awe her; and thus with my head a little raised (for she had thrown me on a bank), we lay looking on each other.

"My native servant, a sewar, who had been in

my service ten years, had now approached to within twelve paces of me; I heard him exclaim, 'Oh God! oh God! Sahib, what shall I do? the horse will not approach nearer.' 'Turn it loose and assist me;' but he came not. I dared not move my head or turn my eye. 'Great God! Chard Cawn! you will not let your master die this dog's death, and not help him?'—but still he came not. I reproached him with every term I could call to mind, but could only hear in reply his exclamations of horror and fear. At length, when sight began to fail, and death appeared inevitable, the monster sprang from me—ran about twenty paces—and fell dead.

"The whole party now crowded round, they placed me in a cummerbund, and bore me to the nearest village. I was almost naked—my clothes were torn to ribands. I fainted two or three times before I arrived there. They washed my wounds with warm water, bound them with linen rag, put me on a bed, and carried me to my tent. Chard Cawn went off express on one of my camels, to a brother officer, Lieutenant Green, who was on a march with a detachment for Deesa; he travelled forty miles before he found him. Green quitted his detachment, and was with me by seven that evening: to his unremitting kindness and care, of which I can never show myself

sufficiently grateful, I am indebted for my life. I was a hundred miles from medical assistance: it was three days before my wounds were dressed, the rags being merely moistened to prevent them from sticking. During that time he constantly rode by my bed, which was born by natives, never quitting me night or day. It was the middle of the fourth day before I arrived in camp; and seven weeks before I quitted my bed.

"I retain the skull of my formidable opponent —the trophy of my hard-earned victory."

Lieutenant Clarke's health was so much impaired, that he was obliged soon afterwards to return to England.

1. Describe the lion as to size?

2. What is his disposition compared with the tiger?

3. Describe the lioness.

4. At what season does she produce her young, and how many at a time?

5. How are they nourished?

6. What are her general habits in rearing her young?

7. Describe the extent of affection when robbed of her young?

8. What are the habits of the lion when in quest of prey?

9. Does the lion hunt by scent?

10. Relate the anecdote given by Mungo Park.

11. State the strength of the lion.

12. How does he kill the buffalo?

13. What is to be remarked on the real courage of the lion?

14. Describe the preference given to human flesh.

15. How do the Arabs subdue the lion?

16. Relate their attachment to their keeper.

17. How is the lion taken at the Cape of Good Hope?

18. Relate the story of a lion hunt.

THE TIGER.

1. Among beasts of prey this animal is usually ranked next to the lion, by reason of its size, muscular power, and ferocity. It has also qualities, peculiarly its own, of which we shall make mention hereafter. 2. Both as to figure and colour the tiger is a very beautiful animal, the ground on the back and sides being a rich yellow; it is white on the throat; and beneath, and over all, there are dark-coloured continuous stripes, which lie tranversely. 3. There can be little doubt that the courage of this beast is quite equal to that of the lion; but at the same time it is combined with a much greater disposition to cruelty, and a wiliness, to which the other does not seem to be prone. On the latter account it is almost impossible in the countries which he infests, to protect flocks and herds from his ravages. 4. The tiger invariably attacks his prey by a stratagem, and having overcome it, tears up

the abdomen, and drinks in the blood with avidity—as a prelude to mangling the flesh. He prefers man to any other prey,—but is easily daunted by a show of resistance. 5. A very marked instance occurred on the banks of a river in Bengal, where a tiger, having approached a festive party, a lady, perceiving it, had the presence of mind suddenly to unfurl a large umbrella. The effect was marvellous, for the animal instantly retired in a panic. But the audacity of this beast is nevertheless almost incredible. Some years ago a party of gentlemen having gone out to shoot at Sangar Island, in the East Indies, sat down fatigued, in the afternoon, near the jungle, and began to take some refreshment. Among them was Mr. Monro, son of Sir Hector Monro. They had not been long in this situation when, with a frightful yell, a large tiger sprang from the thicket and bore off Mr. Monro. A tigress accompanied the male. Two shots were fired, the second of which caused the tiger to drop his prey; but the unhappy victim, although he received attention, was so fearfully lacerated, that he died within twenty-four hours afterwards. The party got to their boats; but the tigress made her appearance on the strand, raging with fury, and watched them until nearly out of sight. So great is the strength of this animal

that it has been known to drag a buffalo out of a quagmire, and carry it off to its den. 6. When engaged in combat with the elephant, the tiger usually obtains the mastery, particularly if it be full grown. 7. Both the tiger and tigress are susceptible of the strongest attachment for man. 8. The tiger consumes about five pounds of meat at one meal, and will lap from three, to three pints and a half of water.

9. Eastern princes take much delight in hunting the tiger, and are attended by large bodies of men well armed and mounted. It is a sport, however, attended with much danger, for the beast almost always sacrifices, at least, one of the assailants to his rage.

10. The tigress produces four or five young at a litter, and nothing can exceed her fury when robbed of them. 11. Those who engage in this dangerous exploit, take all the cubs, and drop one as they run, which she finds, takes up, and conveys to her den, returning afterwards in pursuit of the rest, which are also dropped, and which she takes up in the same way; so that by this means the captors have time to arrive at their boat with one, or, perhaps, two, for their trouble. 12. The mother, on arriving at the shore, exhibits the most sanguinary violence, and howls frightfully. Indeed, the long, acute, tremulous

howling of this beast, more especially when heard in the dead of night, is indescribably horrible.

1. How is the tiger classed as to size?

2. What is the appearance of the tiger?

3. Is the tiger possessed of much courage?

4. How does he attack his prey, and what does he prefer?

5. Relate the anecdote of the approach of a tiger in Bengal, also the death of Mr. Monro at Sangar Island, and the fury of the tigress?

6. What is the strength of the tigress when engaged with the elephant?

7. What is their attachment to man?

8. What quantity of meat do they consume at a meal?

9. What are they valued for in the East?

10. How many young are produced at a litter?

11. How are the cubs obtained from the den?

12. What are the movements of the dam in pursuit of despoilers?

THE PANTHER.

1. The panther, as well as the leopard, is found in Africa and in the East Indies. 2. It is in length, sometimes, as much as six feet. Like the leopard, it is exceedingly ferocious; it is also marked with dark spots like that animal, but they are differently arranged, and the ground is much deeper in colour. 3. The ears are pointed; the eye restless and piercing, and there is much white on the chest and beneath.

1. Where is the panther found?
2. What is the size?
3. Describe its appearance?

THE LEOPARD.

1. This is a very beautiful animal, about four feet in length, exclusive of the tail. 2. The skin is a brilliant yellow, marked with annular spots of a dark colour. 3. In most of its habits this animal resembles the tiger.

1. What is the size of the leopard?
2. Describe its colour.
3. What animal does it most resemble?

THE OCELOT.

1. This is the last in the list of the larger animals of this description, and very much resembles the domestic cat; but it is of considerably greater size, being nearly four feet in length, and about two and a half feet high. 2. The colour is a bright tawny, variegated with dark spots and stripes. 3. The native country of this animal is South America. No instance has hitherto been knonw of its being thoroughly tamed. 4. It crouches before springing on its prey, much in the manner of the lynx.

1. What is the size of the ocelot?
2. Describe its colour.
3. Where is the ocelot found, and is it tameable?
4. How does it seize its prey?

THE LYNX.

1. This beast has very long erect ears, ornamented with tufts of black hair; the body is four feet, the tail six inches in length; the hair is long and soft, and dark spots are spread over the surface. 2. This animal commits most serious devastation among flocks, feeding only on the blood and the brains of its victims. 3. It is found chiefly in the vicinity of the Lake of Balkask, in Tartary.

1. What is the size of the lynx?
2. What are its habits?
3. Where is the lynx found?

THE WOLF.

1. The wolf is larger than the dog, measuring frequently three feet and a half in length. The colour is a dusky iron-grey, black, or white. The head is long; the nose pointed; the teeth large; the ears erect; the eyes slanting, and of a dazzling green; and the entire aspect wild and inexpressibly savage.

2. The wolf may be classed among the most

voracious of animals, and as it is proscribed the haunts of men, and easily eluded by many wild animals, it is frequently starved to death. 3. Naturally cowardly, it becomes emboldened by hunger, and will attack, supported by numbers, horses, oxen, dogs, and even men. 4. The gluttony of this beast is unbounded, and it will sometimes even fill its stomach with mud, and never objects to carrion. 5. The wolf that has once eaten of human flesh prefers it ever after to every other kind; and in Languedoc, in 1764, no less than twenty persons, women and children, became the prey of one of these animals: it avoided the stronger and better armed *male* peasant, for its cunning is quite equal to its voraciousness.

6. Wolves are numerous in the Pyrenees, Switzerland, and other parts of Europe, and some are found in France. They once infested Great Britain, and were the terror of the inhabitants; but they have long been exterminated. In many parts of Asia and America they still abound.

7. The wolf is more than usually fierce in the winter, when food is scarce, on account of which our Saxon ancestors called January, *Wolf-month*, and outlaws were called *Wolfshed*, or abandoned to wolves.

1. Describe the wolf.
2. How is it classed?
3. On what does it feed?
4. What is to be remarked of its gluttony?
5. Does the wolf prey on mankind?
6. Where are they most numerous?
7. When is the wolf most fierce?

THE COMMON BEAR.

1. The common bear is in length from six to seven feet, the average weight about 1000 lbs.; Captain Lyon mentions one weighing 1600 lbs., in length eight feet seven and a half inches, girth seven feet eleven inches. 2. The habits of this animal are solitary, and when pressed for food it is extremely savage. Its haunts are mountain caves and the depths of the forest. 3. Kamschatka is over-run with this kind of bear, which is characterised by short round ears, small winking eyes, a prominent snout, strong legs and thighs, very long feet, long sharp claws, and acuteness of scent. 4. In the winter it resides in the mountains, and in the spring descends to the rivers in search of fish, of which it eats the heads: and it makes no scruple of robbing the nets of the fishermen wherever it may find them. 5. This bear seems as though it were fond of the sound of its own voice—a deep and surly growl.

6. The Kamschatka bear is remarkable for kindness of disposition, never molesting the women and children who gather herbs in the midst of numbers of them, and not even turning upon their assailants when wounded, (7) with the exception of the dam, when its young are wounded, a circumstance which renders it furious. 8. The female goes six months with young, and generally brings forth two cubs.

1. Describe the common bear, its size and weight.
2. What are its habits and natural disposition?
3. In what country is it most generally found?
4. Where does it reside, and on what does it feed?
5. What is to be remarked of its growling?
6. What is to be remarked of the Kamschatka bear as to its disposition?
7. What mark of motherly care is evinced by the dam to her wounded offspring?
8. How long does the female bear go with young, and how many does she bring forth?

THE AMERICAN BEAR.

1. This is a smaller kind of bear than that of Europe, with a longer head and ears, and more pointed nose. The hair is more glossy, and the cheeks and throat are a yellowish brown colour. They are sometimes quite black on the rocky

mountains, in the plains of Colombia, and in the mountainous parts of the United States. They are not ferocious, nor do they attack man without provocation; but when wounded, they turn on their assailant with flinchless energy. The female brings forth two cubs in winter, and so great is their mutual attachment, that nothing but absolute destruction can separate the mother from the cub or the cub from the mother. 2. A gentleman a few years ago, travelling near Fort-snelling, on the Missouri, saw a she-bear with two cubs, the size of puppies a month old; on perceiving him the cubs ascended a tree, and the dam raised herself upon her hind legs in an erect posture, at the foot of the tree, to render protection. The rifle discharged with fatal aim, laid the parent lifeless on the earth. The hunter then approaching stirred the body with the butt end of his gun, on which the little ones hastily descended and attacked him with great fury, attempting to bite his legs and feet, which their youth, and want of strength, prevented them from in juring.

1. Describe the American bear compared with the European.

2. Relate the anecdote of the bear and her two cubs on the Missouri.

THE POLAR BEAR.

1. The polar bear has small ears and eyes, and very large teeth; the hair is long and harsh, and of a yellowish white colour, and the tips of the nose and claws are black. 2. They are prodigiously numerous in the polar regions, both on the land and on the masses of floating ice.

3. The ferocity of this animal is only equalled by its daring, when pressed by hunger; but it is easily amused by throwing anything in its way. 4. It feeds chiefly on seals, but will sometimes attack the Arctic walrus, though rarely with success, the strength and sharp tusks of the latter rendering it a formidable adversary. 5. The polar bear is much attached to its young, and will dare anything in their defence; it also revenges an injury (by being fired upon, &c.,) in the most determined manner. 6. On one occasion a polar bear, after receiving two shots, became so infuriated that it swam to the boat of the whaler from which they proceeded. On this, one of the seamen, with a stroke of his hatchet, cut off its paw. The boat reached the ship, and the men got on board; but the bear clambered to the deck, and even up the shrouds after its enemies, and was only prevented from reaching them by another

shot, which happily took effect. 7. The polar bear brings forth two young at a time. 8. During the extreme cold of the winter season they bury themselves under the snow, and remain there in a state of torpidity. 9. Moderately cold weather is that which suits them best; and the aversion which they demonstrate to heat is of the most marked character. 10. In the Zoological collections both of Paris and London, it is found indispensable to provide them, during all seasons of the year, with the means of bathing,—so as to preserve the body in a cool state.

1. Describe the polar bear as to its general appearance?

2. Where are they most numerous?

3. What are its habits when pressed by hunger?

4. On what does it feed, and what is the success of his attacks on the arctic walrus?

5. What is the affection of the polar bear towards its offspring?

6. Relate the anecdote of the wounded bear.

7. How many does the polar bear bring forth at a time?

8. Where do they take shelter during the storms of winter, and in what state are they preserved?

9. What kind of weather is most conducive to their health?

10. What are the opinions of naturalists as to their health in a domiciled state, as in the Zoological Gardens of London and Paris?

THE ELEPHANT.

AMONG fossil remains the bones of animals, considerably larger than the elephant, have been discovered; but it is superior in size to any other land animal of the present time. 1. The male elephant in height, from the ground, is sometimes over twelve feet, the back is about five feet across, and from the line of the forehead to the insertion of the tail, fifteen feet. The head, neck, and legs, are comparatively short, but thick.

2. The proboscis hangs nearly to the ground; there are two tusks; the eyes are small and full of meaning; the ears pendulous; the mouth small; and the tail of moderate length, thicker near the end. The colour is dark-ashen, approaching to black.

3. The trunk of the elephant supplies the place of a hand and an arm. It is exceedingly flexible, and with it he conveys food to his mouth; raises weights; uses it for defence and offence, and as a means of smelling and respiring. The length of this proboscis is about seven feet, and is essential to the wants of the animal, compensating, as it does, for unwieldiness in other respects.

4. The tusks are sometimes seven or eight feet

long; they are called *ivory,* and are very rarely found in the female. 5. Those parts of the skin which are not callous, are extremely sensitive, and on this account much annoyance is experienced from insects. 6. To obviate this species of torment, the elephant, immediately after bathing, covers all the tenderer parts with dust. 7. Grass and roots form the usual food in a wild state; but when tamed, it will eat oats, hay, barley, &c. It has been supposed that elephants live to a great age—as much as even 300 years—but this is very problematical: it is subject to many maladies.

8. Elephants are much attached to their young, and in crossing rivers carry them on their tusks, the proboscis being twisted round them for better security. 9. As they travel in herds, the larger animals go first. 10. If they meet with one of their own species dead, they cover it with leaves; and if it be wounded, they succour it, and conceal it from pursuit. 11. In this respect they differ much from most other animals, which seem disposed to *persecute* such as are in a state of suffering.

12. The young suck at the teat, and press with the trunk, in order to facilitate the flowing of the milk.

13. The elephant is tamed without much difficulty, and becomes extremely docile; at the same time, it is sensible to insult, or to slight, which it

never forgets. 14. There is one circumstance which exhibits the possession of reasoning faculties in a strong point of view: the animal is naturally *vindictive;* but it always apportions its revenge to the *amount of injury it may have received.* 15. The work done by an elephant is equal to that of six horses; and in the East Indies their labours are truly astonishing, both in carrying goods, and in assisting to stow them on board the boats which descend the rivers.

16. They are used in the dock-yards of that country to drag heavy timber from place to place, and were formerly employed in the launching of ships. 17. An instance is related of an elephant, which, after repeated attempts, found the task too much for it: its master called out "take that *lazy* beast away!" and apparently understanding the taunt, the animal rushed once more against the vessel, and fractured its skull on the spot.

18. They are not now used offensively in war, as they would rather be an incumbrance than otherwise; but in dragging artillery over hilly ground they are invaluable, not only for their great strength, but also for the extreme care which they display. 19. Unfortunately, there are few which are not subject to periodical madness, in which state they will sacrifice those to whom they are most attached.

20. The modes of capturing the elephant vary in different countries. At the Cape of Good Hope, pit-falls are employed; and sometimes the animals are attacked by men, well mounted, and armed with sharp spears.

21. An instance is related of three Dutchmen at the Cape, who having realized a fortune by elephant hunting (pursued for the sake of the teeth, or *tusks*), determined on returning to Europe after one more capture. They accordingly sallied forth, and meeting with a large elephant, one of them advanced to the attack, but his reception was fatal to him. Seizing him with its trunk, the animal threw him to an immense height, and having caught him again on its tusk, so as to impale him alive, turned round, as if in derision, and gazed upon the brothers. They, in dread and deep sorrow, immediately galloped off.

22. In India the same methods are adopted; and, in addition, a female elephant is frequently employed to approach the male leader of the herd, who is thus entrapped, and the remainder are easily driven into an enclosure sufficiently strong to prevent their escape.

23. The mutual attachment of the male and female is very great, and free from that tyranny and caprice which is observable in most other animals not wholly domestic.

It is unnecessary to describe the number of very curious tricks and actions which, on account of its wonderful sagacity, the elephant is taught to perform. 24. The food required daily by one of these animals, when in a menagerie, may be estimated at one truss of hay, one truss of straw, a bushel of barley-meal mixed with bran, as a mash, thirty pounds of potatoes, and six or seven pails of water.

1. Describe the size of the elephant.

2. Describe the proboscis, tusks, eyes, ears, tail, and colour.

3. What are the uses of the proboscis, and what is its length?

4. What is the length of the tusks?

5. What parts of the skin are subject to annoyance?

6. What does the elephant do, to avoid the annoyance of flies and other insects?

7. What is the food of the elephant in a wild state, and when tamed?

8. How are elephants attached to their young?

9. How do they travel in a wild state?

10. What do they observe in meeting with a dead elephant?

11. Is this not different from other animals?

12. How do the young receive nutrition from the mother?

13. How are elephants tamed?

14. What may be remarked as to the apparent faculties of the elephant?

15. What is the proportionate power of the elephant compared with the horse?

16. Where are they principally used?

17. Relate the anecdote of the elephant being accused of laziness.

18. How are they used in war?

19. When under periodical madness, on whom do they evince most hatred?

20. How are wild elephants captured at the Cape?

21. Relate the anecdote of the three Dutchmen?

22. What is the mode of capturing the elephant in India?

23. What attachment is there observable between the male and the female elephant?

24. What is the daily food of an elephant in a menagerie?

THE RHINOCEROS.

1. The rhinoceros is of two kinds, the single and double horned. Both have the hoof cleft into three. The body of this animal is equal to the elephant; and were it not for the shortness of its legs, it would exhibit a figure equally stately. The natural term of life is sixty or seventy years. 2. A single, and sometimes a double black smooth horn is situated near the extremity of the nose; these are sometimes three feet and a half in length, adhering to the skin, without any connection with the bones of the animal. 3. This animal, from

great muscular power, is enabled to move with rapidity in search of food, and if unmolested is perfectly quiet; but when enraged, it becomes the most irrascible of all animals. 4. The skin is strong, the eyes small, and sight dull; but the senses of hearing and smelling are exceedingly acute. 5. The flesh is eaten, and is much like pork in appearance, but coarser and stronger in taste. 6. When hunting the rhinoceros, he is easily taken, on account of his inability to see objects, excepting those immediately in front; and on his springing at the horse, the latter easily turns aside, and averts being ripped up by the horn, and the huntsman alighting, with his sword cuts the tendon of the leg, and renders him a helpless being. 7. The flesh is eaten in India, and the skin, hoof, and teeth are used medicinally, and the horns are held in great repute as an antidote against poison. 8. This animal was formerly considered the unicorn of scripture, and the Indian ass of Aristotle; but Mr. Campbell, the missionary, saw one at Mashow, in South Africa, which answers more closely to the description than the *unicornis or bicornis;* the skull of this animal in now in the museum of the Missionary Society of London. 9. The head measures, from the ears to the nose, three feet; the black horn rising three feet, and behind it a conical horn

eight inches in length. 10. The body is described as larger than the two former-mentioned. 11. The rhinoceros is destitute of hair, and is extremely pestered with flies, to avoid which he rolls himself in mud, giving an incrustation to his skin, and repeats the process as often as it may be required. 12. During the period of their covering themselves with mire, they are often pounced upon by the hunters, and dispatched with mortal wounds inflicted in the belly, the most vulnerable part of the animal. They are natives of Bengal, Siam, Cochin-china, Sumatra, and Java.

1. How many kinds are there of the rhinoceros?

2. Describe its horns?

3. What is the natural disposition of this animal?

4. What is to be remarked of its senses?

5. Is its flesh of any use?

6. What is the manner of hunting the rhinoceros?

7. In what repute are its skin, hoof, teeth, &c., held by the Indians?

8. What is said of its resemblance to the unicorn of Scripture?

9. What is the admeasurement of the head of the newly-discovered species?

10. Of what size is its body stated to be?

11. In what manner does the rhinoceros guard itself against the attacks of flies?

12. What opportunity do the hunters frequently take to kill this animal?

THE HIPPOPOTAMUS, OR RIVER-HORSE.

1. This animal is now found only in the middle and south of Africa; it formerly found its way into Egypt by means of the Nile. 2. It is very massive, covered with an almost impenetrable skin, with little hair; the legs are short, and the belly reaches nearly to the ground; the head is large, terminated by a large muzzle which contains their large front teeth; the ears and eyes small, the tail short. 3. They live in rivers and on land, feeding on roots and other vegetable substances; they are naturally quiet, but exceedingly ferocious when enraged. 4. This animal is next to the elephant in size; the length of the male seventeen feet, the circumference of the body fifteen, the height seven, the legs three, the head three and a half, and the girth of the head nine feet. The mouth, when open, is two feet wide. 5. The teeth of the lower jaw are long, and so hard that they strike fire with steel, a single grinder weighing three pounds; the tusks twenty-seven inches long. 6. The flesh of the hippopotamus is wholesome food, and much sought after by the Hottentots and Caffrarians, and the dried tongues at the Cape are sold at high prices.

1. Where is the hippopotamus found?
2. Describe its appearance?
3. Where do they live?
4. What is its size?
5. Describe the size and properties of the teeth?
6. Where is the flesh eaten?

THE CAMEL.

1. The camel unites in itself many very valuable properties, and is, to the native of the East, one of his most desirable acquisitions. 2. It is, to him, the horse, the cow, and the sheep; for it carries him and his burthens; it is excellent food when young: the milk is delicious, and the hair is decidedly superior to any other material for the fabrication of stuffs for clothing. 3. The height is usually about six feet, the neck long and bent, the head small, large dull eyes, a hump on the back which is double on the Bactrian camel, and the whole body is covered with dusky hair. 4. There is a callous protuberance at the bottom of the breast, one on each knee, and one on the inside of each leg. 5. The foot is not divided quite through,' and therefore the animal, while treading the burning desert, is not subject to chops in the hoof, or sores. Indeed, *sandy tracts* appear to be the native locality of the

camel, which dislikes, and has even a difficulty of walking on any other kind of ground. 6. The power of abstinence, both as to eating and drinking, is truly surprising. Without any show of discontent, they take, Devon informs us, but a single feed of beans in the course of the day; or a few dates, or balls of barley-meal; or even the miserable produce of the thorny plants of the desert: and they will do without water for as long a period as fifteen days! 7. At the same time there can be no doubt that their internal structure favours the secretion of liquid for the purpose of occasionally appeasing thirst; and the liquid so retained is always clear and sweet. 8. By a surprising instinct it will discover (apparently by scent) water at a distance of from two to three miles, and will proceed in the right direction for it without any intimation from its driver. 9. The usual load of a full-size camel is commonly a thousand pounds weight, which it will carry at the rate of forty miles a-day. 10. They will kneel in order to be loaded, and, if oppressed with overweight, utter lamentable cries, and strike at their conductors with their heads. 11. In fact, though naturally mild, they are extremely sensitive to injustice, and determined on revenge; but if this be appeased by throwing a garment in their way (which they tear to pieces), its owner

may again approach in safety—for the injury is forgotten. 12. Like the elephant, they have periodical fits of madness, at which times they are exceedingly dangerous, and will take up the first person they meet, with their teeth, and trample him to death. 13. The pace of the camel is a high swinging trot; and the kind of saddle used is made very hollow. Once fairly seated, the pace becomes pleasant, and endurable for long journeys.

1. What is the utility of the camel to the eastern inhabitants?

2. For what are they substitutes, and for what purposes are they used?

3. What is the size, and with what is the camel covered?

4. What is there at the bottom of the breast, on each knee, and on the inside of the leg?

5. How is the hoof divided to suit the sandy desert?

6. What is to be remarked as to the abstinence of the camel?

7. What is the food necessary in the desert, and what water do they require? What is to be remarked as to the structure of the camel to resist the cravings of thirst?

8. Does the camel anticipate the approach of water, and at what distance?

9. What is the usual load of a camel, and at what rate per day does it travel?

10. How are they loaded? and if overloaded, what utterance of discontent do they evince?

11. Is the camel sensitive as to treatment, and are they revengeful?

12. What is observable as to the periodical fits of insanity in the camel?

13. What is the movement of the camel?

THE GIRAFFE, OR CAMELOPARD.

1. The head of the giraffe, or camelopard, resembles that of the horse, but it has two straight horns about six inches long each, blunt, and tufted with black hair; the ears are long, the eyes large and beautiful, and the neck very long, furnished with a short erect mane which runs all down the back. 2. When the neck is elevated the height from the hoof of the fore-foot to the top of the horn is about eighteen feet, and the length from the nose to the tip of the tail is about twenty-one feet. 3. The colour is a reddish white, with rusty spots, which are paler in the female. 4. The giraffe is very courageous when attacked, and will, by kicking, frequently so annoy the lion as to compel his retreat. 5. The giraffe may be seen in the Zoological collections of London and Paris. It requires very great care in the choice of its food, and in keeping its apartment warm and of an equal temperature: and it should, if pos-

sible, have an Arab attendant with whom it is on familiar terms. 6. In the lonely deserts of Africa, and chiefly in Ethiopia, this very singular quadruped has hitherto been found,—and there only.

1. Describe the camelopard generally.
2. What is its height and length?
3. What is its colour?
4. What is to be remarked on the courage of the giraffe?
5. Where are the best specimens to be seen, and what care is necessary to keep them in health in this country?
6. Where is the giraffe to be found in a natural state?

THE HORSE.

1. This noble animal is found in almost every part of the globe, excepting within the Arctic Zones. In a state of wildness he is very superior to those of his species which are confined to the stable or the pasture, as far as physical appearance is concerned. 2. The countries in which the horse is found thus free from constraint, are the Tartarian and African deserts, wherein these animals congregate, sometimes to the number of five or six hundred. 3. Those, however, which have the advantages of the wild horse, as to air and pasture, and have, at the same time, a certain degree of training, are very superior to all others; and *those*

are the celebrated breed of *Arabia.* The horses of the last-named country are incomparably docile and attached. They are the fleetest animals of the desert, and are capable of enduring extraordinary fatigue.

4. The Arabs do not allow their horses to eat during the day; but at night they hang a bag of barley about their heads, on which they feed until morning. They also occasionally give them beans; and it is thus obvious that they live and labour hard; their appearance is always rather lean than otherwise.

5. The Arabs are very particular in registering the breed of their horses, of which there are three distinct classes:—the *noble* and pure; the *ancient* but somewhat mixed; and the *common* kind. 6. In point of *size,* they are inferior to those bred in civilized countries; the mane and tail are short, and the hair inclining to black.

7. In the Ukraine they are almost impracticably wild, and are therefore chiefly caught for food, the flesh being exposed there in the markets for sale. 8. The breed of horses in this country has been brought to the highest perfection, for all the purposes of draught, the chase, and the race-course; and has, in consequence, acquired great celebrity. The best of our racers are of Arab descent, and that fine race-horse "*Childers*" is

said to have gone over eighty-three feet in a second of time.

9. With all his powers of body and intellect, the horse is nevertheless one of the most tractable of animals, and never exerts himself, under any circumstances, to the prejudice of his master; for he is not subject to those periodical fits of madness which bring the camel and the elephant, at such times, within the category of the more savage denizens of the forest and the wilderness.

1. Describe the horse in his wild and domesticated state?

2. In what countries is he found wild?

3. Which is the most celebrated of this kind?

4. How are the Arabian horses fed?

5. How do the Arabs class their horses?

6. Describe the size and colour.

7. Where are the wildest met with, and for what purpose are they caught?

8. Where are the best horses met with?

9. Describe his superiority over the camel and elephant

THE ASS.

1. THOUGH in appearance much resembling the horse, and of the same *genus*, yet the species is altogether distinct, ranking with the zebra. In

a wild state the ass has many properties not observable in those of its kind which are tame. It is lively, has much beauty of form, and is surprisingly fleet, indeed, defying the huntsman in any regular pursuit; whereas in its domestic state it is dull and heavy.

2. The Persian monarchs have always been fond of the chase of the wild ass; and one of them fell a sacrifice to it; for, in his ardour, he overlooked one of those pit-falls which abound in the vicinity of the city of *Teheran*, dashed his horse into it, was thrown, and died on the spot. 3. In Spain, Egypt, and Arabia, the ass is very carefully bred and reared, and grows to a very large size, and much elegance of appearance; retaining also much of its original fleetness, and exhibiting less of that dulness and obstinacy common to the ass of this country. 4. The Spanish ass is sold at a very high price. In South America the ass is exceedingly sure-footed, and is used as a means of descending steep and very dangerous declivities of the mountains called the "Andes."

5. It is lamentable to observe that, in this country, although the ass is the most patient, and the most laborious of the four-footed tribe, it is nevertheless frequently treated with much inhumanity and even cruelty.

The following anecdote is exceedingly curious, and has not hitherto been published in England:—

6. During the French revolution, *Beaumarchais*, the celebrated writer, was one of those whose life was sought by the rapacious party then in power. He lived in a very fine house on one of the *Boulevards*, or public walks, and one morning whilst in his garden, he perceived, through the wicket at the end of it, a little girl, who cried piteously, at the same time fondling an ass which had fallen upon its knees. There were heavy panniers on its back, and it was evidently overloaded. *Beaumarchais* saw at once how matters stood, and partly unloading the ass he raised it to its feet. The panniers were filled with butter, cheese, and cans of milk. He then brought it some corn and a bucket of water. All this time the poor little girl was so delighted that she could hardly give utterance to her gratitude. Before she left, *Beaumarchais* purchased from her a portion of the load, in order to lighten the poor beast. A few days after this, the governors of France caused an attack to be made upon *Beaumarchais's* house, and it was with great difficulty he escaped with his life. He traversed several narrow streets, and at last found himself about four miles from home, on the road to Vincennes. He conti-

nued walking until nightfall when it began to rain heavily. Alas! poor *Beaumarchais* had now neither home, shelter, bed, nor food to eat! But, a kind and merciful Providence was watching over him, and his humanity was about to meet with its reward. There was no light to indicate any habitation near, he therefore got under the door-way of a barn, so as to be sheltered from the rain; and there he resolved to stay all night: thinking, however, there might be some one sleeping in the barn, he knocked and called several times, but there was no answer. There was, nevertheless, a good deal of noise, as if some animal were kicking violently, and then something appeared to push against the door. At last he heard a man's voice, exclaiming, "Do you hear, daughter, the ass has broken loose." *Beaumarchais* then repeated his call, and the door was opened by an old man with a benevolent countenance, who inquired the cause of his being out on such a night. But, before he could reply, the little girl, who held a lantern near the stranger, almost screamed with delight, and the ass came forward and began to lick his face and hands. The story was now told, and *Beaumarchais* was taken into the cottage *behind* the barn, where a good fire was lighted, his wet clothes exchanged, a plentiful

supper was put before him, and a bed prepared, in which he slept more soundly than he had done for weeks previously. In a few days he went to Paris, and found that all was tranquil. The government had changed, and *Beaumarchais* was no longer in danger. After making a present in money to his host, he accordingly returned to his house — but he never forgot the incident of the *ass*, and the disinterested kindness of its proprietor. He wished to purchase it, but as the old man and his daughter could not make up their minds to part with it, he made them a present in money, with a request that the ass should have plenty of food, and be kindly treated.

7. The wild asses congregate together in large herds, and when a strayed horse comes within their reach, they surround him, and kill him by kicking, and afterwards tear him to pieces.

1. What is the appearance of the ass, and of what genus is this animal?

2. Describe its estimation in Persia, and the fatal effects in a hunt to a Persian king.

3. How are they treated in Spain, Egypt, and Arabia,— are they valuable?

4. For what are they useful in South America?

5. How are asses treated in this country?

6. Relate the anecdote of *Beaumarchais* during the French

revolution, his miraculous escape, and the providential way in which he met a reward for former kindness.

7. What is the conduct of wild asses towards the horse?

THE ZEBRA.

1. The zebra is in character intermediate between the horse and the ass; but in a wild state it is larger than the latter, and resembles it in form. 2. To the figure and grace of the horse, it adds the light elegance of the stag. The alternate black and white bands or stripes with which the animal is ornamented, are arranged with the greatest exactness parallel to each other over the whole body, head, legs, thighs, ears and tail of the zebra. 3. There is a slight difference of shades in the male and female zebra; in the male they are black and cream-coloured, in the female alternately black and white. 4. The zebra is found in all the warmer parts of Africa, and in their native plains assemble in large herds, and by kicking and biting, endeavour to destroy any strayed animal which may come in their way. 5. They are said to be untameable; but there was one some time ago in the Tower of London, which would suffer a boy to be placed on its back without biting or kicking, and it was sometimes in the habit of going to the canteen for a draught of ale, a beverage which all

the horse tribe are particularly fond of. 6. In the Zoological Gardens the zebra is found to be easily domesticated, and it may eventually become generally useful in warm climates.

1. What does the zebra most resemble?
2. Why is it compared to the horse?
3. What is the difference in the appearance of the males and females?
4. Where is the zebra found?
5. Are zebras tameable?
6. Have they ever become useful as beasts of burthen?

THE STAG.

1. OF all the deer genus, the *stag* is certainly the most beautiful, as much on account of the graceful flexibility of its limbs, as for the noble appearance of the horns which branch over its head.

2. It is only the males which have horns, and these they shed at the end of February. On such occasions the animal retires to some very hidden covert, and feeds only during the night. 3. A soft tumour—very sensible to suffering, if ungently touched—first arises, and antlers follow, and rapidly arrive at maturity.

4. This animal is gregarious; many females, with their young, feeding at a time, with one male at their head. Fifty years is the extreme length of life of a stag.

5. The female produces one young one early in June. Her natural affection is extraordinary, and she will even permit herself to be pursued by the huntsman to screen her young. 6. Among the most formidable of her foes while the young one is quite helpless, is the stag itself. 7. The stag feeds upon grass, and upon the young branches and shoots of trees, and chews the cud.

8. The courage of the stag is undoubted. 9. An ounce, (or hunting tiger,) was some years ago matched against a full-grown stag by the Duke of Cumberland in an area of enclosed net-work fifteen feet high, during the time of Ascot races, and within sight of the ground. The brow-antlers of the stag were, however, too formidable, and the ounce, despairing of success, at one leap cleared the net-work, and created an indescribable panic among the crowd! The disappointed animal, however, crossed over to the wood, and fastened on a fallow deer, which it brought to the ground. The keepers ventured to approach, cut the deer's throat, separated the haunch, and brought the ounce away with it in his mouth, growling, but offering no resistance.

1. What is the appearance of the stag?

2. Which sex is possessed of horns, and when are the horns shed?

3. What is the first rudiment of the growing horn?

4. How do they live, and to what age do they arrive?

5. How many are produced at a time, and what is the affection of the mother?

6. What is considered the greatest foe?

7. On what does the stag feed?

8. Is the stag courageous?

9. Relate the anecdote of the Duke of Cumberland's hunting-tiger and the stag.

THE REIN-DEER.

1. The rein-deer—an animal whose exterior presents many points of resemblance to the stag—is much used by the Laplanders and Norwegians as a means of conveying them in sledges across the frozen snow. They are remarkable for docility, and a steady cantering pace. Both the male and female have horns; the hoof is very broad, and the entire length is about four feet. 2. It is of inestimable value to its owner, constituting his greatest wealth, and serving as a substitute for sheep, cow, and horse.

Mr. Dillon says that "the rein-deer always trots with his head low. 3. His mouth he keeps open, and, by his excessive panting, leads one unacquainted with his habits, to suppose that he will drop down dead in a few minutes. Yet nothing is more deceptive; for I have driven a deer, who exhibited all these symptoms while yet

in sight of the starting-place, seventy miles in the course of the day, without finding that he was more exhausted the following day. 4. It is his hardiness, and ability to provide himself with food, whatever be the depth of the snow, that render him so valuable. 5. In this last respect he surpasses even the camel, for he never dies of want, and rarely of fatigue.

6. " It is curious to see the deer feed on these occasions; for, though not disengaged from the 'pulkas,' as soon as they scent the moss beneath the snow, they begin scraping it aside with the fore foot, and in a few seconds dig through four or five feet to the ground. Sometimes there is so much snow, that they disappear in the holes they have made, and their horns alone are seen, while the 'kerres' remain above them on the surface. 7. In later years the rein-deer have occasionally suffered severely from the mildness of the weather, this happens when the surface of the snow is first thawed, and afterwards rendered impenetrable by a crust formed by a subsequent frost. The poor animals are thus unable to get at the moss, their only food, and die in great numbers.

8. " It is only during winter that these animals enjoy any comfort, as even moderate cold is insufficient for their nature. The great heat of their northern summer subjects them to much pain,

and brings with it their special plague, in the form of a gadfly (*œstrus tarandi*). 9. Linnæus, in his Flora Lapponica, describes the mode in which this insect tortures the rein-deer. About the beginning of July the latter shed their coats, at which time the hair on the back is erect. The œstrus flutters the whole day over the herd, and takes the opportunity of dropping on them an egg, scarcely the size of a mustard seed. The state of the coat at this season favours its admission, and protected by the heat of the part, a larva is produced that finds its way into the flesh, and continues there the winter, increasing to the bulk of an acorn. As the warm weather comes on, it becomes restive, and worries the poor animal almost to madness, till it has eaten its way through the skin. Six or eight of these tormentors, and sometimes even more, fall to the share of each deer; the young ones, after their first winter, are most subject to their attacks, and Linnæus adds that a third or fourth part of the calves fall victims to this complaint, which is known among the inhabitants by the name of kurbma. 10. As soon as an œstrus is observed fluttering about, the greatest confusion exhibits itself in the herd; they fly from the obnoxious insect, running against the wind, and driving from them any unfortunate individual who has received the unlucky windfall. While suffer-

ing under the irritation of the gnawing, they rush madly into the sea, and feel some relief while under water. On this account, many of the Laplanders keep near the shores of the Icy Sea during the summer, and only return to the interior about September."

Mr. Dillon who has been some time in Norway and Lapland, and published his travels in those countries, thus describes the *sledge* used by the natives, and also gives some particulars of the rein-deer:—

11. "The sledge used with rein-deer is in general called 'kerres;' that which is used for travelling, and which is decked over the fore-part, is distinguished by the name of 'pulka,' In shape it resembles a small sea-boat, the stern of which has been cut off and replaced by an upright board. It is klinker built, with a broad keel, and sufficiently high behind to support the back. From stem to stern it is scarcely more than four feet long, and just wide enough to admit one person of moderate dimensions. It is dragged by a trace of deerskin, fastened to the bottom of a collar of the same material. This is passed between the fore and hind legs of the deer, and is made fast to the head of the boat. A single rein of plaited deer's sinews, or walrus-hide, serves at once to guide and drive him on. Should he flag, it is

easy to quicken his pace, by drawing it sharply along his side. The thong is not fastened to his horns, as is generally supposed, but round his head, and it is sufficient to throw it over to his right side to make him move on. The traveller is usually bound in the sledge with cords, which prevents his being dislodged when the pulka is thrown on its side, an event of hourly occurrence with beginners. With such tackle it is a doubt which is the greatest feat, driving a postchaise a whole stage without a pole, or bringing a pulka down a steep descent at a gallop, without reaching the bottom before the deer. With regard to the deer, none that I saw were larger than the common English fallow-deer. Those in Russian Lapland, near Kola, are said to be much taller; while the wild ones in Spitzbergen, though exceedingly fat, are much inferior in size. All, however, are much stouter in the limbs than any of the same family, and have feet peculiarly formed for the climate they inhabit. The hoofs do not look remarkably large when raised off the ground, yet each time they strike the snow, spread so as to cover a greater surface than a bullock's foot. By this formation they are enabled, with their comparatively light carcases, to traverse wilds of untrodden snow, sinking scarce four inches, where a horse would be irretrievably lost. It has been

remarked that no animal is so difficult to keep alive, out of his native country, as the rein-deer. The limits of the regions suited to his nature are more narrowly defined than those of any other known creature. It is difficult to keep him as far south as Stockholm; the warmth of the climate even there being too great for him. I nevertheless think that there is still a greater difficulty to be overcome than that of climate, to which he might be hardened, after a few generations. The spreading of their feet would make, moving over a hard, dry surface, a very toilsome exercise. In their own country the snow has scarce time to melt before it again covers the soil, and, during the short interval that it is bare, they tread chiefly on soft morasses."

1. Describe the rein-deer, and its utility to the Laplanders?
2. For what does it serve him as a substitute?
3. How does the rein-deer move in the sledge?
4. How does it obtain its food in the snowy season?
5. How does it subsist compared with the camel?
6. How do they commence operations when finding food?
7. What does the rein-deer suffer most from?
8. What is the effect of a northern summer on this animal?
9. What insect is most disastrous to the rein-deer?
10. How does the *œstrus* make its attack?
11. Describe the sledges of the Laplander?

THE DOG.

1. Of all animals the dog is that which becomes most obedient to man, and which assimilates itself most closely to his habits. 2. There are so many varieties in the species of this animal that we shall not have space to enumerate them; and as they are so well known it becomes the less necessary to enter upon such a detail. 3. Although so docile, and attached to those who have the care of it, the dog is a very formidable animal when it becomes wild.

4. Two Irish grey-hounds, belonging to a settler in Van Diemen's Land, ran away to the woods, became irreclaimably wild, multiplied their numbers, and, at length, were found to be a most fearful scourge. They were so bold and rapacious, as to attack even *man*, if unarmed; and made such depredations in the sheep-folds as might be parallelled only by those of the tiger. By many strenuous efforts they were, at length, exterminated. 5. Another instance, not dissimilar, is that which occurred in the Island of Ascension a few years ago. The inhabitants were much plagued with rats, and introduced the bull-terrier as a means of getting rid of those vermin; but

although the dogs effected this object, they became wild, increased their numbers, and were then infinitely more formidable than the rats.

6. In the Ghauts of Western India there is a species of wild dog, of a reddish colour, about the size of a full grown pointer, which is much more daring, and as rapacious as the fox. 7. Northern Africa offers to us the singular spectacle of an organized community of dogs; for it is well known that in Cairo and Alexandria the dogs assemble regularly at night, as scourges of the city, which they occupy street by street, placing sentinels to warn them of any person's approach. 8. A native, understanding their habits, and by them immediately recognised, may pass down the street in safety; but a stranger would be inevitably torn to pieces. A short time ago a sailor at Alexandria undertook, for a wager, to enter one of the streets so occupied, at midnight, and was attacked, killed, and savagely mangled by his canine opponents. 9. Some few of the race of the blood-hound still remain in this country, and have been occasionally employed to trace offenders against the laws. Formerly they were in great request for this important service, and always, when put upon the right scent, performed their duty effectually; and although they did not voluntarily molest, they imperatively prevented the

escape of the offender. 10. Many anecdotes are told of dogs, which exhibit their wonderful sagacity and memory in a very strong point of view; and as these acts are dictated usually by a love for man, and total absence of that *caprice* and *cruelty* inherent to most other animals, they are peculiarly interesting. 11. To select from among the number would, however, be difficult; but one of the most attached and useful of this class of animals is the *Newfoundland dog*.

12. This great instinctive property has, no doubt, been implanted for the wisest purposes, and must raise the minds of all, who duly reflect, to a consideration of the infinite goodness of HIM in whom we "move and have our being," and to whom our whole lives should be devoted in a spirit of praise and gratitude!

1. What is to be remarked of the dog with regard to his fidelity to man?

2. Are there many varieties of this species of animal?

3. What is to be remarked on the wild species?

4. Relate the anecdote of the two Irish greyhounds becoming wild in Van Diemen's Land.

5. Relate the occurrence of the rats and terriers in the Island of Ascension.

6. Describe the wild dog in the Ghauts of Western India.

7. Describe the dogs of Northern Africa, Cairo, and Alexandria.

8. Describe the difference between the usage to strangers and foreigners.

9. State the use of the blood-hound.

10. Have dogs evinced the powers of memory and a love for man without caprice?

11. Which is the most attached and faithful of the canine species?

12. What may be deduced from the instinctive properties inherent in the canine species.

THE FOX.

1. This animal is considerably smaller than the wolf, and has a more bushy tail; but the slanting position of the eyes and the shape of the ears are similar. The height is about one foot, and from the muzzle to the extremity of the body, about two feet and a half; it is of a fawn colour, intermixed with black and white.

2. The fox cannot be thoroughly tamed, and pines when deprived of liberty; under such circumstances it is playful but capricious.

3. Of all predaceous animals this is the most crafty, as is proved by the manner in which it secures its prey; and its voraciousness is also so great that when it enters a poultry-yard, it continues its ravages at intervals during the whole night, destroying, and then cautiously abstracting and concealing its prey.

4. The female brings forth from four to five cubs, which grow until about eighteen months old. 5. They live about fourteen years. 6. They yelp much in the winter; but in summer are silent. 7. They afford excellent sport to those who are fond of the chase.

1. What is the size of the fox?

2. Can the fox be tamed?

3. When the fox has satisfied his hunger by devouring fowls, what does he do with the residue killed?

4. How many young does the female fox bring forth, and what is the period of their growth?

5. What is the longevity of the fox?

6. What are their habits in summer and winter?

7. What sport do they afford to the hunter?

THE GOAT.

1. There are few mountainous portions of the globe wherein this animal is not common, in a wild state; and in most countries it is made subservient to domestic purposes. 2. The goat may justly be termed the inhabitant of the rock, the tenant of the mountain top and the precipice; browsing in places totally inaccessible to other animals. 3. Whether wild or tame, it is exceedingly fantastic and amusing in its actions. 4. It is frequently employed to draw the carriages of children; and the milk it produces is very nutri-

tive and delicious. 5. The female produces two or three at a time. 6. The wild goat is chiefly found in the eastern mountains, in Caucasus, Persia, and various parts of Hindostan.

1. Where are goats generally found?
2. What places do they generally browse on?
3. What are its habits?
4. In what domestic purposes is he employed?
5. Are they prolific?
6. Where is the wild-goat found?

THE COMMON OX.

From this stock are derived all the varieties of the domestic cow, &c., so indispensable to the uses of man.

1. This animal, in its wild state, is found in many parts of Europe, Asia, and America. Among the Carpathian solitudes it is not uncommon; in India it is of a smaller size, and humped; (2.) and in Southern America is very numerous, and hunted by means of the *lasso*, or rope, with a noose, which the Indian throws over it at full gallop.

Captain Head (now Sir Francis Head), in a work which he published, called "Rough Notes," and which is descriptive of a tour which he made in South America, gives a very entertaining account of the mode in which the Indian inhabitants

use the *lasso*. 3. When the Indian is engaged in hunting the wild cattle, he dashes after them on horseback at full speed; and when he sees his opportunity, he dexterously flings the rope so as to make it fall over the head and horns of the animal. The latter in its struggles only tightens the noose; and the Indian gallops onward, his horse *leaning on one side*, so as to counterbalance the efforts which the captured animal makes with a view to effect its escape, but which it seldom accomplishes.

4. Sir Francis Head informs us that on one occasion the *lasso* was used for a very terrible purpose indeed. The governor of a district in South America, who was a cruel tyrant, so exasperated his subjects, that they resolved to get rid of him; and for that purpose some of them met, and determined that he should be put to death by the *lasso*.

It was the custom of this governor to sit every afternoon in a balcony facing the street, the climate being very warm; and as these balconies are built so as to be in the shade, the inhabitants spend a good deal of time in them. One afternoon, an Indian galloped through the town at full speed, and as he approached the governor's balcony, he threw his *lasso*. The jerk was instantaneous; the governor was dragged over the

balcony, and killed on the spot, and the Indian was out of sight almost immediately.

Another governor was soon after elected, who did his duty, and was beloved by the people.

5. The breed of cattle, in this country, has been carried to the highest perfection, in all respects. There are various sizes, from the immense Durham prize ox, fattened up for exhibition, to the small and beautifully shaped Alderney description.

1. Where is the ox found in a wild state?
2. How are they hunted?
3. Describe the *lasso* and the Indian dexterity.
4. Relate the anecdotes on this subject.
5. Have the breeds of cattle been much improved?

THE COW.

1. The cow is an animal of vast utility to man. She provides us with milk and cream; and these are manufactured into cheese and butter. 2. When killed, the cow produces *beef*; and the calf, when killed, produces *veal*. 3. The hides of the cow and the calf are used for making *leather*; and cow's hair, is employed for stuffing mattresses, mixing with mortar, and other purposes.

1. What is the cow?
2. When killed, what food does she afford?
3. What are the uses of the hide and hair?

THE SHEEP.

1. It will not be necessary that we should say much of this animal, although one of the most useful and necessary to man—for it is familiar with, and continually under the observation of all.

2. The varieties of this inoffensive quadruped are very numerous, and are to be found in most parts of the world.

In this country, in Scotland, and in Wales, there is a *small* breed remarkable for the sweetness of its flesh. 3. The *wool* produced generally from the flocks bred in the United Kingdom, is an article of the highest commercial importance.

4. Sheep are prolific, the ewes producing two and sometimes four lambs in a season.

1. Describe the utility of the sheep.
2. What are its varieties?
3. Describe its commercial value?
4. How many do they produce annually?

THE COMMON HOG.

1. There are many peculiarities about this animal which are worthy of remark. Although so dull and unwieldy in external appearance, it is exceedingly sagacious, and capable of much activity. 2. It eats up almost any animal refuse, and be-

comes, nevertheless, a most sweet and nutritious food, when killed, for the table. 3. It is, however, very particular in scrutinizing the vegetables given to it, and always eschews those of a poisonous or hurtful kind. 4. These animals are capable of much affection for each other, and when one of them suffers, all others in its vicinity run to its assistance. 5. The female has a very numerous litter, sometimes producing from twenty to thirty at a time. 6. The wild-boar, the origin of the common stock, is found in many European countries. It usually lives solitary in the forests, but the females congregate together with their young, and thus form a society for mutual defence.

7. The wild boar has formidable tusks, is fierce and bold, and when pursued, sometimes turns on the huntsmen, and becomes a very dangerous assailant.

1. What is to be remarked in the common hog?
2. On what does it live?
3. Is it particular as to its food?
4. What is their affection for each other?
5. What is the common litter of the hog?
6. What is the wild boar, and where is it found?
7. Describe its ferocity.

THE SQUIRREL.

1. This little animal is entitled to much admiration for its elegant appearance, activity, and liveliness, and it may be easily domesticated. The colour is a bright brown, except on the breast, and beneath, which is white. The eyes are bright and black; the ears are tufted with hair; and the tail is long and bushy. 2. Squirrels appear to dislike heat; and during the summer come out only in the evenings, when they frisk about with much liveliness.

3. The squirrel builds its nest among the forked branches of trees; and it is of so firm a texture, that it cannot easily be dislodged. It is capacious and warm, and protected by a cone over the entrance from the inclemency of the weather. 4. A store of nuts and acorns is laid by it in the various hollows of the tree, to which recourse is only had when forage abroad is not to be obtained. Thus the squirrel *prepares against wintry days*, and in this respect sets an admirable example to man.

5. If the tree in which the squirrel resides be but touched, it instantly leaves it, bounding from tree to tree with surprising agility; and does not return until all apparent danger has subsided.

Squirrels abound in northern and temperate cli-

mates. 6. The *grey squirrel* and the *flying squirrel* are natives of America, and, like that we have described, of about the size of a small rabbit. The *flying squirrel* is distinguished by having a membrane all round the body, which enables it to support itself in the air during a leap of from sixty to ninety feet.

1. Describe the squirrel?
2. What are the habits of the squirrel during summer?
3. Where and how do they build their nests?
4. How do they provide food when they are not able to forage?
5. Describe the sensibility of this animal when in danger.
6. Describe the grey and flying squirrels

THE RABBIT.

1. This animal is still more prolific than the hare, breeding seven times during the year, and producing seven or eight at a birth. 2. Thus the progeny of a single pair, for about four years, will amount to about a million and a half! But the rabbit is the prey not only of man but of most animals. 3. Rabbits burrow deeply in the ground, and the female is extremely attentive to her young during about a month; at the expiration of which time they provide for themselves.

1. Describe the rabbit when compared with the hare.

2. What is the supposed number from a single pair in five years?

3. Where do they reside in a wild state?

THE HARE.

1. This timid little animal is found in most countries; and although it has no means of defence, the faculties of seeing and hearing are so perfect, that it easily perceives the approach of danger; and the structure of its hind legs fits it to run with extraordinary speed. 2. The hare feeds during the evening, and in the day time remains in its *form*. The food of hares consists of parsley, the bark of trees, &c. 3. They breed during the whole year, excepting in the depth of winter; the female going with young about a month, and producing two or three at a time, which are suckled for twenty days. 4. By keeping a brace of hares in a walled garden, the produce has been found to be *fifty-five* hares in twelve months.

The hare has many enemies; and none greater than man,—who hunts it on account of the delicacy and flavour of its flesh. 5. Formerly hawks were employed in the chase of this animal, as well as dogs; but the pursuit of it is now confined to the latter.

6. The hare has been frequently domesticated;

and young ones have sometimes been brought up by cats deprived of their kittens. The fur is much used for various objects.

1. What is to be observed on the hare?

2. When, and on what does the hare feed?

3. How long does the female go with young, and how many are generally produced?

4. Relate the number produced per annum within a walled fence.

5. Were not hawks formerly employed in capturing the hare?

6. Can the hare be domesticated?

THE WEASEL.

1. The weasel is about seven inches long from the nose to the insertion of the tail, and its height is about two inches and a half. The breast and beneath is white, but the rest of the body is a pale brown. The ears are small; the mouth round, and furnished with whiskers; and it possesses extraordinary flexibility of body. 2. It lives near rivulets, and under the roots of trees, and sallies out in quest of prey towards evening.

The weasel is an enemy to rats, mice, and moles; but it is also destructive to pigeons, poultry, rabbits, and eggs. It sucks the latter with avidity, making a small aperture, and leaving

the shell in other respects in the same state, whereas the rat destroys and disfigures the shell.

3. The hare exhibits a surprising alarm on beholding the weasel, and instantly gives itself up for lost.

4. So wild is this animal, that it has been thought impossible to tame it; but this has been accomplished, and Mademoiselle de Laistre gives a very amusing account of one which she had succeeded in domesticating, and which became both familiar and affectionate.

5. A rabbit, hare, or bird, bitten by the weasel, rarely recovers; for it usually reaches some vital part, near the head, with its small sharp teeth, the mark of which can with difficulty be discovered.

6. The weasel is fond of objects in a state of putrescence. Buffon found one which had taken up its abode in the body of a dead wolf. 7. In the spring the female brings forth four or five young at a litter.

1. Describe the weasel.

2. On what does it live?

3. What does the hare evince at the approach of the weasel?

4. Can this animal be tamed?

5. What are the effects of the bite of the weasel?

6. Is it fond of putrescent substances?

7. How many young do they bring forth at a litter?

THE FERRET.

1. The ferret is one of the fiercest of the minor animals. It has small, red, fiery eyes; a nose more pointed than the weasel; short ears; and a long and flexible body. 2. Africa is supposed to have been the original country of this animal; and, as it degenerates here, those who keep it cross the breed with the pole-cat. 3. By warreners it is regularly trained to the chase of the rabbit in its burrow, but it is always muzzled, its rapacity and thirst for blood being excessive. 4. The female, indeed, has been frequently known to *destroy all her young*, amounting to seven or eight in number. In the winter it is kept in a warm cage, where it remains for the most part in a dormant state. 5. It is very bold, and even the young ones will unhesitatingly attack any rat they may meet.

6. The odour of this animal is offensive; and has the effect of driving away rats and other vermin from farm-yards, where, otherwise, they are so apt to swarm.

1. Describe the ferret.
2. To what country does it owe its origin?
3. For what purposes is it trained?
4. What is the treatment of the female to its young?

5. What is the disposition of the ferret?
6. What is to be remarked of the ferret?

THE GUINEA-PIG.

1. The guinea pig has many habits in common with the rabbit, but in point of appearance may be compared to a rat without a tail. 2. They are timid, perfectly harmless, very clean in their habits, delicately alive to cold or moisture, and extremely prolific. 3. It feeds on bread, grain, fruit, and parsley, and is not capable of any marked attachment.

1. What is to be remarked of this animal as to its habits and general appearance?
2. Are they timid, and alive to cold or moisture?
3. On what does it feed?

THE DOMESTIC CAT.

1. The appearance and habits of this animal are so well known, that few remarks are necessary. It is by no means so faithfully attached as the dog; but it has occasionally exhibited singular intelligence in memory of the kindness it may have experienced.

2. In one of the French departments a poor wo-

man was found murdered in her bed, over the head of which sat a large white cat, that nothing would tempt to leave its post, not even the offer of food. 3. At length, after some days, two men, suspected of the murder, were brought into the room—and the cat became their accuser—she jumped on the floor, and fixed her fiery and dilated eyes on them for some seconds; they shrank within themselves at this unexpected event, confessed the crime, and the animal instantly crept under the bed.

4. There is a Persian variety of the cat, which has the tail nearly half as thick as the body, and is altogether a very handsome animal, though not superior as a *mouser*, or killer of rats, to the kind which we commonly see.

5. The cat, if suffered to wander about fields and woods, soon becomes wild, and in that state commits depredations among poultry, &c., as terrible as those of the fox. It is, indeed, much bolder and more savage than that animal. 6. The average number of kittens, in a domestic state, is about six at a birth, of which it is rare that more than one or two are suffered to live.

7. The colour varies in the tame species, through every gradation, from black to tortoiseshell; but the wild cat is usually of a dusky yellow.

1. What are the habits of the cat compared with the dog?

2. Relate the anecdote of the cat and a murdered female in France.

3. What was the manners of the cat when the murderers came in her sight?

4. Describe the Persian cat, as to its appearance and utility.

5. Does the domestic cat ever become wild, and what are then its habits?

6. What young does it generally bring forth?

7. What are the general colours of this animal, domestic and wild?

THE MOUSE.

1. Of this little animal—one of the smallest of quadrupeds—it is only needful to observe that it is exceedingly timid and inoffensive, though very destructive in the store-room. Few houses are exempt from it. It is very prolific; and the cat is its natural enemy.

There is a *white* variety, with red eyes, which is pretty and much admired. These are commonly kept in revolving cages.

1. Describe the mouse, its habits and food.

THE RAT.

1. Of all the smaller animals, this is the most inimical to man, wherever the opportunity for acting on the offensive may occur. In this country and in northern Europe generally, the rat is about the size of a young rabbit, with a sharp snout, whiskers, and bright piercing eyes, in which *cruelty* is a conspicuous feature. 2. In the East Indies this animal is much larger in size and much less savage in its habits; it is, however, equally destructive everywhere, amongst poultry, eggs, and provisions.

3. Its cunning, too, is surprisingly great; and an instance has been communicated to us of a gentleman in Archangel, who, in order to protect a Cheshire cheese from this animal's depredations, hung it, by means of a wire, three feet from the ceiling. After the lapse of a month he proposed taking down the cheese, in order to consume it; when great indeed was his surprise to find, that in lieu of being heavy it was quite light; the fact was that the contents had been eaten completely out, leaving only the rind! A small round hole near the wire was all the exterior evidence of the devastation that had been committed. How the rats had contrived to arrive at the wire he did not

discover till some time afterwards, when it became obvious that an aperture had been made through the chamber above, so near the insertion of the wire, and so formed as it respected the way in which the rays of light fell from the window, as not to be discernible except on close inspection.

Rats are usually found near the dead and the dying; and the vaults of churches are much infested by them.

4. Some years ago, in the west of Ireland, a gentleman, who had accompanied a party to view some of the extensive vaults of a cathedral, was supposed to have quitted them again before the rest of the company, whereas he had fallen asleep in a remote corner. His friends, under this impression, returned to their houses, many miles distant. In the dead of night he awoke, and to his horror found himself surrounded by rats, which, had already begun to gnaw at portions of his face, and which flew at him furiously the moment he began to stir. When aid arrived (alas! too late), he was in almost the last state of exhaustion from loss of blood and the strife he had been engaged in; and he survived only long enough to narrate the fearful account of his *doom*.

1. What is the size of the rat in Europe compared with that of India?

2. What are its habits?

3. Relate the cunning of the animal in Archangel?

4. Relate the anecdote of their attacking a gentleman in Ireland?

THE MOLE.

1. This little animal is very singular in its habits and appearance. It has very minute eyes, broad bare palms to the fore feet, a pointed nose, and an exceedingly glossy skin. Their sense of hearing is very acute, and they live chiefly under ground. The female brings forth four or five young at a time, in the month of April. They are capable of great mutual attachment and live in pairs: their food is acorns and other vegetable substances.

1. Describe the mole; their sense of hearing, their attachment to each other, and their mode of living.

THE BADGER.

1. The badger has a thick body and legs, in length about two feet eight inches to the end of the tail. The hair is coarse, the teeth and claws remarkably strong. Though naturally very inoffensive, this animal is formidable when attacked.

They have a bag beneath the tail, from which a disagreeable odour arises. Badger-baiting is a very cruel and unmanly sport, but is now becoming rare. 2. The female produces four or five young annually. 3. They live in pairs in clefts of rocks, and in burrows, and sleep during the whole winter in beds, composed of dried grass. 4. The hair is used by the brush-makers; and the flesh, when they are in condition, is good and nutritious. The skin of the badger is dressed with the hair on for various purposes.

1. Describe the badger and his natural habits.
2. How many does the female produce?
3. How do they live, and what is their state in winter?
4. What is the use of the badger?

THE HEDGE-HOG.

1. The length of the hedge-hog varies from six to ten inches and a half; the back, head, and sides are covered with what are called *quills;* on the nose, the breast, and beneath, is a covering of fine soft hair; the legs are short and bare, and the tail is about an inch long. 2. Hedge-hogs live on fruit and insects, and on meat, when they can get it, and wander about chiefly at night. 3. This animal bears only a distant resemblance to the

porcupine, differing much in the structure of the mouth, and in the shortness of the quills. 4. When pursued, it rolls itself up, and offers an effectual obstacle to attack, in the arms which nature has given to it.

5. If it be domesticated, it becomes very useful in the destruction of cock-roaches. 6. In the winter season it rolls itself up in a warm covering of leaves, and remains torpid until the spring. 7. There are six species besides the one described. They inhabit Guiana, and the Indian Archipelago.

1. Describe the hedge-hog.
2. On what do they live?
3. What does it most resemble?
4. What is peculiar to it when pursued?
5. What is its use in a domestic state?
6. What is its state in winter?
7. How many kinds of this animal are there, and where are they most numerous?

THE OTTER.

1. This animal is an inhabitant of the banks of rivers, and its principal food is fish.

Otter hunts were once common in this country, and productive of much sport. There are many still found near the Lakes of Cumberland.

2. They will prey upon rabbits, young pigs, and poultry, when pressed by hunger, and are ranked as amphibious. They are naturally of a ferocious disposition, but may be tamed, though in training they require much assiduity. 3. The female produces four or five young about the month of June.

1. Describe the otter.
2. Upon what do they prey?
3. How many are produced at the same time?

THE BAT.

1. The bat has large web-formed wings like the foot of a duck, but covered with hair instead of feathers, and a body like that of a mouse, with powerful claws. This animal forms a link between birds and those animals which are not winged. 3. Some of this class are of very great size, particularly the *Vampire Bat* of South America, which sometimes causes the death of travellers, wearied and reposing in the woods. It effects this by slightly puncturing the extremity of the foot, and sucking the blood, at the same time fanning the victim with its wings to promote sleep. The loss of blood is sometimes so

great, that the unhappy sleeper, on awaking, finds himself unable to stir, and perishes on the spot. 4. There is also a species called the *Long-eared Bat*, similar in size to the common bat. The female bat produces two young ones, which she suckles, and sometimes carries about with her. 5. The smaller kind of bat is a native of most countries, and has occasionally been tamed.

1. Describe the general appearance of the bat.

2. Where is the Vampire found?

3. What are its habits, and baneful effects on the wearied traveller in South America?

4. What is the next species of bat?

5. How many young does the female produce at once, and how are they fed when young?

BIRDS.

THE EAGLE.

1. This bird stands at the head of the feathered tribe, and sustains this rank, as much by its size, and the majesty of its conformation, as by its strength, courage, and rapacity.

2. A species well known in Europe, and one of the largest, is the *golden-eagle*. It measures three feet from the beak to the insertion of the tail feathers; and the wings, extended, measure from point to point, about seven feet. The beak is hooked and very strong; the colour of the head and neck is tawny, bright behind; the body, generally, is brown; the tail is variegated with ash-coloured bars; the legs are yellow, and feathered to the toes; the toes are scaly, and the claws are very large. 3. Naturalists have observed that there are many points of moral and physical resemblance between the *eagle* and the *lion*. Both disdain petty revenge; avoid carrion; are tem-

perate; love *solitude and to reign supreme;* have eyes of the same colour and glare; claws of the same shape; a cry similarly terrible, and an equal indocility, fierceness, and daring. 4. The eagle pursues its prey by means of its acute faculty of sight, and carries off geese, hares, and sometimes lambs and kids. 5. If it attack and kill a calf, it gluts itself with the blood and heavier parts, and carries the remainder to its *aerie.* This last is built on some solitary and inaccessible rock, or in an ancient tower, and is usually about two yards square. 6. It is constructed of long stiles covered with furze and rushes, in alternate layers; and in it, is generally found a good stock of provisions consisting of one or two lambs, a hare, game-birds, &c. The eagle has been known, in many instances, to seize upon young children, and carry them away, even in the sight of the mother. 7. This bird lives to a very great age, one having been in confinement, at Vienna, for a century, at the period of its death. 8. They will bear very long abstinence, some having been known to exist for a month without food.

1. What are the characters of the eagle?
2. Describe the golden eagle.
3. What are its habits in common with the lion's?
4. How does it pursue its prey?

5. What are its first movements on killing a calf?
6. Describe its nest and stock of provisions.
7. Does the eagle live to a great age?
8. How long can the eagle exist without food?

THE VULTURE.

1. These extremely voracious birds abound in warm latitudes, and will feed on the most nauceous food. They make their nests in cliffs.

1. Where does the vulture abound, and where does it make its nest?

THE FALCON.

1. This bird bears some resemblance to the eagle. When erect, the height from the ground to the top of the head is three feet. The beak is sharp and crooked; the colour a bluish-ash, inclining to black towards the extremities. The legs are long and stout, the claws are crooked and black; and there is a tuft of feathers behind the head, which the bird can erect at pleasure.

2. The rapacity of the falcon is excessive; but it is nevertheless very useful in countries where serpents abound, being a most determined enemy to these reptiles. 3. Le Vaillant shot one immediately after it had overcome, and was about to feed upon a serpent; and found in its craw the remains of three long serpents, eleven large

lizards, as many small tortoises, and some locusts, and there was also a hard ball formed of vertebræ, shells, claws, wings, and other fragments.

1. Describe the falcon, its height, colour, and appearance.

2. Describe the disposition and general food.

3. Relate the appearance of the craw of one shot by Le Vaillant.

THE SWAN.

1. The swan is a very beautiful and graceful bird, and is by no means uncommon in this country. It is strong and courageous; is very delicate in the choice of food, and lays from six to eight eggs at a time. 2. The colour is a pure white; and the only sound it utters is a disagreeable *hiss*.

3. The black swan of Australia has been imported into Britain, and bears the climate well. The black swan is a tyrant on the waters, and will allow no other swimming bird to live near it; the whole plumage is black, with the exception of the first six quills, which are white; the bill, and a naked part round the eye, are red. 4. Its length is about four feet and a half, and the wings shorter in proportion than the white swan. 5. The male is particularly watchful of the female whilst sitting, and of the young cygnets; he drives off all

other birds, and shows great courage even in attacking men. 6. He raises his wings, his feathers become ruffled, and upon the whole has, in his own eyes, a formidable appearance. 7. He is in his gait exceedingly ludicrous, which makes it appear that walking is really more than he can manage with any degree of comfort to himself, without any toil of battle added to it. 8. As a curiosity, the black swan is very well, and the more especially that it was for such a length of time considered no where to be met with; but it has none of the beauty and grace of the white swan as an ornamental bird.

1. What is to be remarked of the swan?
2. Describe its colour, and the sound it utters?
3. Describe the black swan of Australia as to appearance.
4. What is the size of the black swan?
5. Describe the attachment of the swan to its young.
6. How does he evince his anger?
7. What is his general appearance on dry land?
8. Describe the comparative beauty of the black and white swans.

DOMESTIC GOOSE.

1. Wild geese dómesticated are the geese of our farm-yards. They are objects of much value in rural economy, and are bred, in great numbers, particularly in Lincolnshire.

2. The quills and feathers are articles of considerable traffic, and are plucked from the goose while alive, a practice, which is extremely cruel, more especially as it respects the *young* birds, which suffer great pain. The goose breeds once and sometimes twice a year.

3. From the various counties where they are bred, they are brought to London, in droves of from one to three thousand at a time.

1. Where are the best geese reared in England?
2. Relate the cruel manner in which the feathers are plucked from them.
3. How are they brought to the London market.

THE PEACOCK.

1. THIS very beautiful bird is about the size of a young turkey-cock. The length from the end of the tail to the bill is about three feet nine inches. 2. The male has a sharp spur, and the tail feathers are of extraordinary length, forming a beautifully variegated train with ringed spots like eyes. The remaining colours on the surface are gold, green, shot with a coppery gloss, azure, violet, dun, black, red, dusky yellow, and dark blue. 3. The pea-hen has none of the resplendency of the male,

and is chiefly of an ashy brown colour; the tail feathers are short. 4. The peacock is said to live sixty years.

1. Describe the peacock as to size?
2. Describe its plumage.
3. What is the appearance of the hen?
4. To what age do they live?

THE OSTRICH.

1. This very singular biped forms a sort of connecting link between birds and quadrupeds. From the top of the head to the ground, the ostrich measures from seven to nine feet; this includes the neck, which is very long, the height from the ground to the upper part of the back being rarely more than four feet. 2. The neck is covered with a kind of hair: the body with black, loose, feathers; the wings and tail, with feathers of showy whiteness, occasionally tipped with black. 3. The thigh and flank are bare, and the feet very strong. These birds inhabit the sandy deserts of Asia and Africa, and wander about in considerable flocks. 4. The ostrich does not fly, but it runs with great swiftness. It grazes on the plains with the zebra and qua-cha; and the noise it makes is a kind of rueful *lowing*. Sometimes, when in flocks, these

birds do great damage to the farm-lands, destroying whole fields of corn at a time, on which occasions they elude observation by bending down the neck and raising the beak to the ears. 5. One male is commonly surrounded by four or five females. The latter lay ten to twelve eggs each, *all in the same nest*, and they will sit and hatch *together*; the male, taking his part of the labour. They are exceedingly careful of their young. 6. The eggs are considered a great delicacy by the inhabitants of Africa, and are eagerly sought for by them; but it is the feathers of this bird which, chiefly, are valuable, and in which the Arabs have instituted a regular traffic. 7. The mode in which the Arabs hunt this bird is singular: they pursue it for several days, until they completely weary it out, when it either turns upon its enemies in despair, or tamely submits to its fate. 8. The ostrich, when domesticated, becomes exceedingly playful and docile, and the Negroes sometimes mount and ride it in the same way as they would a horse, which it far exceeds in speed. 9. The ostrich is extremely voracious and swallows almost any substance within its reach, such as nails, glass, leather, stones, bullets, &c.; these, probably, aid digestion, in a stomach of naturally great strength.

1. Describe the ostrich.
2. What is to be remarked on the plumage of this bird?
3. What part is bare, and what countries does it inhabit?
4. Can the ostrich fly?
5. How many females are there to one male, how many eggs do they lay, and how is the hatching carried on?
6. Are the eggs of the ostrich valued as an article of food, and by whom?
7. How do the Arabs hunt the ostrich?
8. Can it be domesticated?
9. Describe the voracious habits of the ostrich.

THE HERON.

1. The length of the full-grown common heron, is three feet and a half, and the stretch of the wings upwards of five feet; the weight is only between two and three pounds; it is of a greyish ash colour, small body, marked with lines of black on the back and neck, with a black bar on the heart; it has a long pendant black crest, long legs, long neck, and sharp beak.

2. The heron is a ravenous feeder on fish; when he has advanced as far into the water as he can, so as not to wet his feathers, he then darts at his prey with unerring aim. 3. The heron is often observed to fish by moonlignt, when the fish come into shallow waters. 4. Willoughby states that he once observed a heron devour no less than

seventeen carp, which, after digesting six hours, returned voraciously hungry, and went to fish again.

5. The same author further relates, that he also witnessed a heron swallow an eel, and had the greatest possible difficulty to retain that slippery animal in his stomach, and that he had the trouble to swallow the same identical eel more than a dozen times over in his presence. 6. This must have been a mistake; for when the bird catches an eel, it immediately makes for land, and quiets its wrigling and twisting, by breaking its scull either with its beak or a stroke of the foot. 7. The heron lays four, and sometimes six eggs. 8. The female, during incubation, sits closely, and is fed by the male; and when the young are hatched, both join in the labour of feeding them, which is no easy task, from their voracity and vigorous digestion.

9. In our olden writers frequent mention is made of this bird, which bears a close resemblance to the stork. They are found in many parts of Africa, Egypt, the East and West Indies, also in England and Scotland. It flies at a considerable altitude.

1. Describe the heron.
2. On what does the heron feed?
3. When is its favourite time to fish?

4. What does Willoughby remark oh the gluttony of the heron?

5. What does he remark on the heron fishing for eels?

6. Is this possible or only imaginary?

7. How many eggs are laid by the heron?

8. How is the female supported during hatching, and how are the young herons fed?

9. Where is the heron found?

THE STORK.

1. The "white stork, as it is called, is found in Egypt: and the numbers are so great that the plains look perfectly *white*. 2. So prevalent are the frogs, lizards, serpents, and other reptiles in that country, that the Astries rather welcome the appearance of these birds than otherwise. 3. They have a grave and even melancholy look; but are, in truth, disposed to be gay whenever there is a cause of mirth; and they are frequently seen to join the gambols of children.

4. The stork is very careful of its young, which it never leaves until they are capable of moving about.

5. Storks are birds of passage, and are very exact as to the time at which they leave Europe for warmer and more southern climes.

1. Where is stork found?

2. What is their utility in Egypt?

3. What is their appearance?
4. What attachment have they for their young?
5. Where do they migrate to?

THE PELICAN.

1. The pelican is web-footed, between five and six feet in length, and about eleven feet in the extent of their wings. 2. The plumage is white, with a faint tinge of rose or flesh colour; the legs are short and stout, but what is most remarkable, is the large pouch under the lower mandible. 3. This bag may be variously extended, and is so, to a surprising degree, when filled with fish. In this pouch the fish are deposited, to be afterwards eaten at leisure, or given in part to their young. 4. Pelicans being expert fishers, the Chinese and other nations turn them to surprising account. When fish is required for the table, they allow them very little food for a few days; in this voracious condition, a ring is put round the neck of the bird, to prevent its swallowing the fish. 5. The pelican then sets industriously to work, and soon returns with his bag full of the finest fish. They are unloaded on its return, and should there not be a sufficiency for the occasion, they are again sent to procure more, and, as a reward for their industry, they are allowed a portion of the fish

last caught. 6. Pelicans and cormorants in concert, practise an ingenious method of catching fish; they spread themselves in a circular form a considerable distance from the shore; they then flap the water with their wings, and narrowing the circle, they thus drive the fish near the shore, where they become an easy prey; the different species of sea-gulls generally claim a portion of the sport. 7. So voracious is the pelican, that a single bird can consume as much fish at one meal as would be sufficient to dine a dozen persons. 8. These birds are found in Asia, Africa, South America, and migrate annually to Egypt in regular companies.

1. What is the size of the pelican?

2. Describe its plumage and pouch.

3. What is the use of the pouch?

4 For what purpose are pelicans kept in China?

5. When thus secured from eating the fish, what is his next movement?

6. Describe the united efforts of the pelican and cormorant in their fishing excursions, and what other birds claim a part of the spoil.

7. Describe the gluttony of the pelican.

8. Where are pelicans found and to what countries do they migrate?

THE PHEASANT.

1. THAT description of pheasant, called the "golden," is very beautiful, with an ample crest more so than even the "silver" pheasant: a broad, folded, and bending tail, and a neck amply cuffed. 2. The plumage is exceedingly bright, consisting of golden-orange and black; that of the female being of a brownish colour, varied with black half-circular bars; and in this latter the tail is short. 4. This bird is now common in England, and was originally brought from China.

1. Describe the golden pheasant?
2. What are the colours of its plumage?
3. What is the native country of the pheasant, and is it common in this country?

PARTRIDGE.

1. OF the many kinds of this bird the Barbary partridge is remarkable for the beauty of the general tint, and of the feathers covering the flanks. The bill and legs are red.

2. The red-legged French partridge is very common, and is also beautiful in its plumage.

3. Partridges are numerous in this and in other temperate climates. 4. They pair in the spring, and lay about twenty eggs, the male sharing the

labour of incubation. 5. The nest is made on the ground, and is composed of leaves and dry grass; and the eggs are frequently made a prey of by weasels, stoats, and other animals. 6. During the winter in Sweden partridges become white, and burrow in coveys in the snow. They never migrate.

1. Describe the Barbary partridge.
2. Where is the red-legged partridge found?
3. Where are they most numerous?
4. When do they pair, how many eggs do they lay, and how is the hatching carried on?
5. Where are their nests generally found?
6. What is remarkable in the Swedish partridge?

THE DOMESTIC COCK AND HEN.

These birds are common, their habits, and the mode of rearing them, are so well known, that it will not be necessary to enter into any very elaborate notice of them.

1. The appearance of the domestic male fowl, when in full plumage, is very animated and noble; and there is a striking evidence about him of sterling courage. 2. He is remarkably careful of the hens under his immediate charge, whom he cherishes and preserves from danger; but is, at the same time, exceedingly jealous of

them, and has been frequently known to kill the hen that may have displeased him. 3. The *Bantam* belongs to a smaller breed, but is a very spirited kind: it was originally brought from India. 4. The *Bantam* hen, after laying about twenty-five eggs, prepares for the tedious labour of incubation, and in about three weeks the young make their appearance.

5. In Egypt the eggs of the domestic fowl are hatched in ovens called Mamels, constructed in the sand, so as to be under the direct influence of the sun's rays: ninety-two millions per annum are thus produced. The ovens are kept at the same temperature as the heat of the hen, and in three weeks the brood begins to make its appearance. 6. In Europe many attempts have been made to arrive at the same result by means of hot air and steam. 7. The whole powers of the Institute of France were directed to this object, but ultimately abandoned the enterprise. 8. This, however was prosecuted by Mr. Bucknell, with unwearied as iduity, for several years, and his results are highly satisfactory: at his exhibition, Pall-Mall, London, upwards of two hundred are hatched daily by his *Eccaleobion* machine and the agency of steam; yet what is surprising, very few of the birds die when due attention is paid to their rearing. 9. In this place we will

make a passing allusion to the *wild cock*, a native of India, and inhabiting the high, wooded district of Hindostan. It is there known, among Englishmen, as the *jungle-fowl*. 10. It is about the size of the domestic kind, but is much more slender and elegant: the comb is large, and double wattles hang from the under jaw. 11. A distinguishing characteristic of the plumage consists in the form of the shaft in the long hackled feathers. Those of the neck, wing, and tail covert, have a dark grey ground; but the shafts are of a bright orange, dilating in the centre, into a flat horny plate. In the middle of the back, on the throat, breast, thighs, &c., a grey colour prevails, the shafts and edges being paler. The tail is of a beautiful green; the feathers which succeed the long hackles, of a rich purple, edged with a pale yellow; and those next succeeding are of a golden green, edged with grey. The legs, feet, and bill are of a yellow colour.

1. What is the appearance of the cock?
2. What care does he evince for his hens?
3. From whence came the Bantam breed?
4. What is the average number of eggs laid by the Bantam?
5. How many fowls are hatched in Egypt per annum, and how is it performed?
6. Have any attempts been made as to artificial incubation in Europe?

7. What was the result of the experiments by the Institute of France?

8. What has been the result of Mr. Bucknell in London?

9. Describe the size of the Indian wild-cock

10. What is to be remarked on the wild-cock of India?

11. Describe the plumage of the wild-cock?

THE COMMON DUCK.

1. So well known is this bird that we shall merely observe, it is adapted, and instinctively prone to, an aquatic life. The female is neglectful of her young, and altogether a very indifferent mother. The duck is prolific, and much valued as an article of food.

1. Give a description of the duck, and the treatment of its young.

THE TURKEY.

1. This bird is supposed to have been introduced from North America, into this country, in the reign of Henry VIII. About the year 1585 it was first seen as an addition to the Christmas table. It is a large bird, of rather handsome plumage, and with a majestic gait. 2. It is exceedingly dif-

ficult to rear,—although in a wild state it thrives well and multiplies rapidly.

3. The female lays in the spring, and exhibits much perseverance in the hatching of her young, as she frequently neglects to take even the food necessary to her support.

4. In Norfolk and Suffolk turkeys are bred in large quantities, and conveyed to the London markets for sale. In a wild state turkeys associate in multitudes, the flocks, sometimes, comprising as many as five hundred. 5. They do not fly well, but they run very swiftly. 6. They are seen in great numbers roosting upon the highest boughs of the forest trees in Canada, and in the more western parts of the United States.

1. From whence was the turkey first brought to this country?
2. Is it difficult to rear?
3. Describe the natural qualities of the turkey.
4. In what part of England are turkeys much bred?
5. Describe the nature of their movements.
6. Where are they to be seen roosting on the trees?

THE PIGEON.

1. The pigeon race are more numerous and widely distributed than any of the feathered tribe. They are voracious feeders, living mostly on vegetables. 2. The pigeon, house-pigeon, or rock pigeon in a

wild state, is by far the most numerous in this country. 3. They often congregate in vast flocks, and destroy the newly sown seeds, and commit great havoc. 4. In New Holland, the isles of the Pacific, New Guinea, and the Sunda Islands, may be considered the native land of the pigeon race; there they are in every variety of colour, and more elegant in form than in this country. 5. In most of these islands they migrate with the monsoons in flocks, excepting some of less powerful flight, which are stationary. 6. The female lays two eggs, and alternates with the male in the labour of hatching. 7. The young are fed by both parents, not only with the bill, but from the stomach, which they continue long after they leave the nest.

1. What is to be observed of the pigeon race?
2. What is the most numerous in this country?
3. What is to be remarked on their destructive habits?
4. Where are they most numerous abroad?
5. Are they migratory in those islands?
6. How many eggs does the pigeon lay, and how are they hatched?
7. How are the young fed by the parents?

THE MACAW.

1. This is a rare and very beautiful bird, and is about eighteen inches in length.

2. The bill is black, and the general colour of the plumage a bright green and red. The wings are crimson, blue, and black; the tail near the ends, blue; the legs, brown; the claws, black.

3. It is gentle to persons whom it knows; but has a great aversion to strangers, and particularly to children. 4. It is a native of Jamaica, Guiana, and the Brazils.

1. What is the size of the macaw?
2. Describe its colour?
3. How is it affected towards strangers and children?
4. To what countries does it belong?

THE PARROT.

1. The ash-coloured parrot is that which is commonly brought to this country, and is about the size of a pigeon. 2. It has great power of imitation, of which many anecdotes are related; but as the bird is well known to most persons, their own observation will furnish them with a sufficient number of instances of this kind.

1. What is the size of the ash-coloured parrot?
2. Can the ash-coloured parrot articulate sentences?

THE KING-FISHER.

1. This is by far the most beautiful of all British birds. The colour generally is a dark green, with transverse spots of blue. The tail is of a deep blue.

2. It feeds upon fish, and darts upon its prey in the manner of the hawk.

3. It lays seven eggs of a transparent white colour. In lieu of building a nest, these birds burrow in some bank, and deposit their eggs at the extreme end of it, upon the remains of such fish as they may have conveyed there.

1. Describe the king-fisher.
2. On what does it feed?
3. How many eggs does it lay, and where does it deposit them?

THE CRANE.

1. The crane is a native of the north of Africa; it is about three feet and a half in height, and three feet in length, the body forming only a small portion of the admeasurement. 2. The plumage of the body is grey, of the sides of the head and the neck black; and over the breast, hairy, long, slender, black feathers. The quill feathers are

of a dazzling black, and so also are the legs and claws. 3. There are vast numbers of this crane at Tripoli, and generally along the coasts of the Mediterranean they are numerous. As there are no feathers on the legs they can stand in the water and watch for their prey without wetting their plumage. 4. Of all the varieties of this bird, that denominated the "demoiselle crane" is the most graceful.

1. What is the locality of the crane?
2. Describe its plumage?
3. From whence are the best birds brought?
4. Which is the most graceful of the crane kind?

THE WOOD-PECKER.

1. Of this bird there are many varieties both in size and colour. That called the *green woodpecker* is generally of a pale green colour, the upper part of the head having a crimson shade, and the tail-feathers being marked with a darker green and with black.

2. Led by a natural instinct, this bird traverses the bark of a tree, *tapping*, as it goes along, until a hollow sound issues; it then by repeated blows, from its strong beak, penetrates through the bark, and whistles loudly so as to disturb and frighten

the insect-colonies within. 3. As they crowd out it makes a prey of them by putting forth its tongue, and so collecting them.

4. In a similar way it ravages the nests of ants. It is by means of the bill also that the woodpecker scoops out for itself a nest in the trunk of a tree; but beyond this it makes no other provision for the warmth of its young. 5. The number of eggs laid by the female is usually six.

1. Describe the woodpecker.
2. What are the habits of this bird?
3. How does it catch the insects?
4. Where does it build, and on what else does it subsist?
5. What are its number of eggs?

THE CUCKOO.

1. This bird is about the size of the magpie; the general colour is a pale blue or dove tint, darker on the head and neck, and paler on the fore part of the breast; the under part is white crossed with wavy bars of black.

2. The cry of the cuckoo is well known, and is usually first heard about the middle of April, and ceases at the end of June.

3. The female deposits its solitary egg in the nest of another bird, in order that it may be hatched

for her, and the young one has a peculiar chirp, which, while it remains in this country, continues, and is, after migration, changed into the remarkable note above alluded to. 4. The nest of the hedge-sparrow is generally preferred by the parent-bird; and it is worthy of observation that soon after it is hatched the young cuckoo turns out the scarcely fledged sparrows as well as any remaining eggs. 5. The cuckoo grows very rapidly and migrates to a warmer climate during the winter.

1. Describe the cuckoo as to size and colour.
2. When is it heard?
3. What is remarkable in the female?
4. Where is the egg deposited?
5. What becomes of this bird in winter?

THE WOODCOCK.

1. These birds are of the snipe genus, and frequent woody localities. They are birds of passage, breeding during the summer in Norway and Sweden, and, at the approach of cold weather, resort to this and other mild climates. 2. At the beginning of march they again leave this country. They are very delicious food.

1. To what genus does the woodcoek belong?
2. At what time of the year do they migrate?

GROUSE.

1. These birds are found in considerable numbers in the northern counties of England and in Scotland.

2. There are many varieties, some, being almost as large as a turkey; of red or black grouse the weight is usually from two to four pounds each.

1. Where are grouse found?
2. What are the varieties of this bird?

THE SNIPE.

1. The snipe is a little larger than the thrush, and is supposed to breed chiefly in Switzerland; it is a bird of passage. Snipes arrive here in autumn, and afford much sport during the shooting season. The flesh is very sweet and tender.

1. Describe the snipe.

SEA-GULL.

1. There are many varieties of this bird, both as to size and colour. The *grey* gull prevails about the rocky shores of the island.

It is rapacious, lays but few eggs, and builds in ledges of the cliffs.

The flesh is black and stringy; but is nevertheless eaten, by the poorer inhabitants of the coast, when salted.

1. Where is the grey-gull found, where do they build their nests, and what is their utility to man?

THE JAY.

1. The back and breast of the jay are of a cinnamon colour; the wing-coverts are blue, barred with black and white; the bill is black; the throat white; and the forehead is ornamented with a beautiful tuft of white feathers, streaked with black; its voice is harsh and disagreeable.

2. It produces six eggs, and the young remain with the parents till next pairing time, when they each seek a mate. The jay, when domesticated, becomes very familiar.

1. Describe the jay.
2. How many does it produce, and can it be domesticated?

THE RAVEN.

1. The length of this bird, when full grown, is nearly two feet from the tip of the bill to the end

of the tail. The colour is black, with a bluish gloss. 2. Ravens are found in most countries, and, having a keen scent, discover carrion at a considerable distance. 3. In the vicinity of fields of battle they congregate in great numbers, and exhibit much cunning in keeping out of harm's way. 4. When tamed, they are very amusing and familiar; but are great thieves, and will steal articles that can be of no use to them, such as rings, spoons, &c., which they conceal in their favourite resort. 5. In a wild state, the female builds her nest in the holes of rocks, lays six eggs, and is attended by the male during the whole of the time she sits, which is twenty days. 6. The raven preys on young ducks, chickens, rabbits, and small animals generally.

1. Describe the raven as to size and colour.
2. Where are ravens found, and what is their general food?
3. Where are they to be found during a time of war?
4. Describe their habits in a domesticated state.
5. Where does the wild raven build?
6. On what do they generally prey?

THE CROW.

1. This well-known bird is by no means so destructive as it has commonly been imagined to be;

for it lives principally upon noxious insects, grubs, and worms. 2. Sometimes indeed crows will attack young rabbits, chickens, and ducklings; and Mr. Montague observes that they have been seen to pounce hawk-like upon pigeons. 3. The colour of this bird is black; the female builds in trees, lays six eggs, and is, during the period of incubation, fed by the male, in the same way as the female raven. 4. The crow, from habit, can be made to imitate the human voice, and from frequent repetition can utter articulate sentences with great accuracy and precision.

1. On what does the crow feed?
2. Do they not attack other animals?
3. What is the colour, where do they build, and what is the habit of the male during incubation?
4. What are the habits of the crow as to imitation?

THE ROOK.

1. The rook inhabits wooded countries, and is the most interesting of the crow kind. 2. It is nearly the same length as the hooded crow, but lighter made and longer in the wings. 3. The whole plumage is black, and glossed with reflections of purple, blue and violet, which, when the bird is in good condition, are rich and beautiful. 4. In England the rook is stationary; but in

France, Sweden, and Siberia, they are birds of passage. 5. In their flights from those countries they are often joined by the common crow and jackdaw, and also by troops of starlings, so as often to darken the air with their density. 6. Rooks resort every spring to breed on the same trees; they seek no solitude, but settle near our dwellings. 7. In constructing their nest, both the male and female take a share in the labour, and whilst the one is foraging for sticks and other materials, the other remains to preserve the nucleus of the nest from being carried away by the neighbouring rooks, who are arduously engaged in the same labour. 8. The female lays four eggs, and during the period of hatching, she is assiduously fed by the male. 9. When the young take wing, the nests are deserted till the following spring, when each pair claim the property of their nest; and should their rights be invaded, the whole community assist in rescuing the invaded nest, and restoring it to the proper owner. 10. The rook feeds chiefly on the grub of the chafer or beetle; in this they are highly beneficial to the farmer, as meadows and corn fields would be laid waste were they not destroyed in this manner. 11. During the snows of winter, the rook is often obliged to retire to the sea-shore, where they feed on the periwinkle and other shellfish. 12. Rooks

are by no means easily deterred from erecting their buildings, and if often destroyed, will repair to a fresh locality. Some years ago, a pair having been often dislodged from a rookery near Newcastle-upon-Tyne, and compelled to quit the settlement, took refuge on the spire of the Exchange, and although constantly disturbed, they succeeded in completing their nest at the top of the vane, and reared their young, notwithstanding the nest and its inhabitants were turned round by every change of winds. The parents kept possession of this chosen spot of incubation for ten successive years, when the spire was taken down.

1. Where are rooks to be found?

2. What is its size compared with the crow?

3. Describe its plumage.

4. Is the rook a bird of passage?

5. With what other birds do they congregate on their flight?

6. Where do rooks generally build?

7. What part do they take in forming their nest?

8. How many eggs do they lay, and how is the female fed during hatching?

9. What is remarkable in the assertion of their rights of property?

10. On what does the rook feed, and is it any way beneficial to the farmer, and how?

11. On what does it feed during winter?

12. Relate the perseverance of the rook, and the location of a pair at Newcastle.

THE MAGPIE.

1. The magpie is one of the most beautiful of British birds; its colours are black, with purple, violet, and green reflections; the breast and belly white. It is about twelve inches long, of considerable extent of wing, and weighs between eight and nine ounces. 2. They are clamorous and mischievous; they live on any species of animal food or fruit; they prey on birds or nestlings, rats, mice, young poultry, leverets, carrion, fish, and insects. 3. Lambs and weakly sheep they destroy by first plucking out their eyes. 4. They are notorious thieves, and will conceal provisions, or any glittering object, by pushing them into holes. 5. When taken young they may be taught to pronounce words, and even sentences, and will imitate any singular noise.

6. Magpies often congregate in council, what are called "folkmoles;" but should a hawk appear, their arguments and chattering are soon at an end, they immediately seek for some furze or cover; when no cover is near they remain motionless on the ground until the hawk is gone, when they commence a congratulatory chatter consoling each other on their fortunate escape. 7. Whilst under the panic of the hawk, they are

so completely powerless that they may easily be taken with the hand.

1. Describe the colour, form, and size of the magpie.
2. On what does he live?
3. How do they destroy lambs and sheep?
4. Are not magpies thievish in their habits?
5. Can the magpie be brought to articulate words?
6. What is to be remarked on their general assemblies?
7. What is their appearance whilst under the panic of the hawk?

THE OWL.

1. On the approach of night the brown owl leaves its place of retirement, and preys upon hares, partridges, and rabbits, as they come out to feed. 2. It also finds its way to the pigeon-houses, and commits terrible ravages, seizing on its prey with the utmost voracity, and tearing it in pieces. 3. All parts of nature are fitted to meet emergencies; in the tropical climates the twilight is very short, and nearly the same all the year round, and under the equator there is only an hour and twelve minutes between sunset and absolute night; in the polar regions, and temperate latitudes, the twilight is much longer. 4. The iris of the owl is so constructed that in the night, or twilight, it is expanded so as to see objects with

great precision; but when the light is strong it is so contracted that the owl flies at random, no light being admitted: it is then left to the powers of hearing, and often so bewildered as to fly against obstructions, and were it not for its inutility to man they would become an easy prey. 5. Thus nature has ordained that the owl shall be located at a distance from the tropics, in order to have a just use of vision. 6. Owls breed in shady groves, hollow trees, crumbling ruins, clad with ivy, churches, with their concomitant associations of graves and ghosts, in such places heard, but seldom seen, render them a kind of doom bird. 7. When the heavens look black, and the gloom of the moment calls forth the owl, his very appearance, according to the annals of superstition, is considered ominous; yet the poor animal only left its retreat simply to see if there was a mouse, a worm, or any other animal to be procured for its breakfast or dinner. 8. On the shores of the Ohio these birds are numerous, and in the deep forests of Indiana; at the approach of morning they utter discordant sounds, resembling the half-suppressed screams of a person suffocating. 9. In proof of their voracity a very large owl, a few years ago, was taken in a foraging excursion, its wing was broken, and in this condition it remained at a farm-house for some days; at last it became

invisible, and thinking it had betaken itself to the woods, no further notice was taken of it. Almost every day after this, however, poultry disappeared in an unaccountable manner, and in eight days few were left; the fox, the minx, and weasel, were considered the reputed thieves: but one morning the old lady rose before day break, and found her late ungrateful refugee, the owl, sumptuously regaling himself on the body of a newly killed chicken; her rage had no bounds, she immediately seized a hatchet, and severed its head from its body, and found in his secret retreat the heads, bones, and feathers, of all her missing poultry.

10. In 1834 Mr. Waterton, of Walton Hall, resolved to establish, *vi et armis*, a colony of barn-owls, as birds of great beauty and utility, amongst the ivy which adorns his ancient gateway; the old house-keeper (rest her ashes) was up in arms at the prospect of such uncouth neighbours, whom she considered as of unearthly aspect and voice; but the wrath of an old woman is nothing to a man who has rode a *cagnian*, or caught a *coucalanaria*, and therefore the Lord of the Manor of Walton willed that the barn-owls should be a *locus standi* in the ancient gateway of his domain —*sic voluit, sic fecit:* the colony of owls was at once firmly established.

They soon increased and multiplied in such a ratio that they speedily spread over the whole country, and were on terms of the strictest intimacy with the whole aboriginal race of owls in the vicinity, receiving visitors both at their nestling places and perches, with the greatest ease, so that Walton Hall became and is still, and likely to continue to be, the very Goshen of barn-owls. The whole country became subject to robberies, and depredations of this hideous and rapacious bird; the hen roosts plundered with impunity, and the bones of the victims, on the ivy gate, bear full and fearful testimony to the great extent of their nocturnal and diurnal rapacity in the circumjacent country, to an extent of fifty miles from Walton Hall.

1. When, and on what does the owl feed?

2. Does it not rob pigeon-houses?

3. Why are they not found in tropical climates?

4. What effect has the light on the eye of the owl?

5. Why is the owl located at a distance from the tropics?

6. Where do owls breed?

7. Was not the owl considered the forerunner of some disaster in superstitious times?

8. Where are they most numerous, and what noise do they make?

9. Relate the anecdote of the owl and the fowls, also his just fate.

10. Relate their locality at Walton Hall.

THE BLACKBIRD.

1. The blackbird is larger than the song-thrush, but not so large as the missel, and not so heavy a bird. 2. They build their nests in shrubs, and breed once, twice, or three times in the season, according to the nature of the situation. 3. The male takes a share in the incubation: they live on worms and insects, consequently they are very useful in the gardens and orchards, which they generally frequent.

1. Describe the blackbird.

2. Where do they build their nests, and how often do they breed in the year?

3. On what do they live, and does the male assist the female during hatching?

THE THRUSH.

1. All the varieties of this bird have straight bills; the tongue jagged at the end, and a few hairs near the corner of the mouth. The upper part of the body is a dark brown; the lower part is lighter and prettily spotted. When full grown its greatest length is about ten inches and a half.

2. The song-thrush, or throstle, is remarkable for the sweetness, variety, and fulness of its note.

1. Describe the blackbird.
2. Is its song remarkable for sweetness?

THE LINNET.

1. This bird is much admired for its song, and is in length about five inches and a half. A reddish brown is the prevailing colour, the edges of the feathers being pale. In spring, the breast becomes of a crimson colour.

2. If taught young this bird will take the note of any other; but his own is so good that it is quite unnecessary to change it.

3. It builds for the most part in hedges, or in furze bushes: and the female lays four eggs. The nest is remarkably neat and warm. 4. If placed in cages, the best food for the young ones is bread and milk until five weeks old; they should then be fed with canary, rape, and linseed; of the latter they are exceedingly fond.

1. Describe the linnet.
2. Can the linnet acquire other notes than its own?
3. Where does the linnet build its nest?
4. On what does the linnet feed?

THE CANARY.

1. The islands so called originally furnished this bird; but it is now to be obtained in most parts of Europe. 2. It is rather more than five inches in length, and of a bright yellow colour, the tail being forked. The note resembles that of the titlark. The best are brought from the Tyrol.

1. Where did the original canary come from?

2. Describe its length, colour, and of what other breed do its notes resemble?

THE SKY-LARK.

1. Birds of the lark species are distinguished by the length of their heels and the loudness of their song. The sky-lark has a kind of crest, which it erects at pleasure. It chaunts in the air, and mounts to an immense height.

1. Describe the sky-lark.

THE SWALLOW.

1. The swallow is very common in England, and may be known by its mode of flight, which differs from that of all other birds. 2. The length of the

common chimney-swallow is usually about six inches. 3. It migrates, during the winter, to Africa and other southern latitudes. 4. Swallows build under eaves and near chimneys ; the nest is composed of straw and clay.

1. In what country is the swallow most common?
2. What is its size?
3. Where are the swallows during winter?
4. Describe their nest and building places.

THE REDBREAST.

1. THIS favourite songster is so well known that it will require little description. The general colour is a brown, dashed with olive-green; and the neck and breast are of a fine red, inclining to orange. Beneath, it is whitish, and the legs are of a colour inclining to black. The extreme length is about six inches. 2. The redbreast is extremely prolific, and breeds in the spring. The nest is built in a hedge, or bank, or in some woody place, which latter it frequents during the summer. 3. No bird is more familiar with, or more attached to man, than the redbreast; but it is delicate when in captivity, and difficult to rear. 4. Insects and worms are its chief food. The latter it cleanses by beating them against the ground, and then eats the outer part.

1. Describe the redbreast.
2. Where are its haunts?
3. Describe its haunts.
4. On what does it feed, and how does it cleanse its food?

THE WREN.

1. The wren is the smallest bird found in this country. It has a very sweet note. The upper part of the body is a kind of brown, the throat and breast inclining to yellowish white; and beneath it is of a dusky red colour. The tips of the wings and covert feathers of the tail are variegated with yellow and black spots. 2. In colour the hen is, generally, of a reddish brown; the lines across the tail and wings being black and reddish.

3. The nest of the wren is very curiously constructed, of an oval shape, with a single aperture, and is built on stumps of trees, on old walls, and sometimes in the ground. It is lined with feathers, and the number of eggs sometimes amounts to eighteen. 4. The wren should have a large cage, and be kept very clean and warm during the winter; and it should be supplied with plenty of dry gravel.

1. Describe the wren.
2. Describe the colour of the hen.
3. Where does it breed?
4. What is to be remarked on domesticating the wren?

BIRDS OF PARADISE.

1. The birds of paradise are found in New Guinea and on the islands in its vicinity; their principal range is under the equator, and abound more to the south than to the north. 2. From the vast plumage of this bird, it can fly in no direction but against the wind; they shift with the monsoons, to which the change of the seasons in tropical climates is to be chiefly attributed. 3. There are eight different species of birds of paradise. 4. The bird of paradise is one foot in length from the point of the bill to the extremity of the tail; but the produced feathers of the flank extend about a foot more. 5. The general colour is a rich cinnamon brown, varying considerably on the different parts. The throat is a golden green, the hind part of the neck purple brown; over the nostrils and on the forehead there are very thick velvety black feathers, with green reflection; the breast and belly maroon brown; the belly yellowish black, and the feet black; all these are sub-

ject to considerable variation in colour in different specimens of the bird. 6. The plumage and appearance of the bird of paradise render it impossible to picture in the mind a more beautiful animal. 7. Birds of paradise perch on the loftiest trees, and live on insects, and in their migrations against the wind, they meet with myriads of insects, which they devour. 8. When the bird of paradise falls in the water it is soon drowned, and when it lights on the land, it requires a stone or some little eminence before it can take wing, and in this helpless state they are often taken, and sold as an article of traffic.

1. Where are the birds of paradise found?
2. How is it accommodated with feathers?
3. How many species of this bird are there?
4. What is its size?
5. Describe its colours.
6. Describe its general appearance.
7. Where do they perch, and on what do they feed?
8. Describe the manner in which they are taken.

THE HUMMING-BIRD.

1. This is a very beautiful bird, varying in size from half that of the wren to that of a humming-bee. The colours are exquisitely beautiful, being de-

grees of crimson, opal, &c. Humming-birds are found in South America, and in the West Indies.

1. Describe the humming-bird, and name the countries where it is to be found.

BRITISH WATER-BIRDS.

1. In concluding the descriptions of the feathered tribes, we will introduce some account of the aquatic birds of this country, confining ourselves, however, to those which belong to the division called "*waders*."

2. There are the *common curlew*, the *godwit*, and the *purre*, or *stint*. They are in fact not formed for swimming or diving, having legs of considerable length, and being destitute of webbed feet.

3. It is during the winter that these birds resort to the southern coasts of England.

4. The "waders" are exceedingly suspicious; and on the most distant indication of any one approaching, they make their escape.

5. They are numerous in the northern countries of Europe, and the curlews form a large portion of them.

6. When breeding on the moors, they are not gregarious; but on the sea-sands in search of

food, they are to be seen forming a long continuous line in search of crabs, worms, &c.

7. Although this bird is extremely shy, yet an instance is recorded in Montagu's Ornithological Dictionary, wherein it was rendered perfectly tame, and remained so for the space of two years.

8. The *godwit* is still more timid than the *curlew*, and the *purre* or *stint* is remarkable for screaming and flying off when surprised, skimming the surface of the water, forming circles, undulating, and alternately receding from and approaching the shore.

9. All these birds congregate on the sea-shore in immense numbers, and if properly pursued afford much amusement to the sportsman.

1. What class of birds are here to be described?
2. What is to be remarked of the *waders*?
3. When do these birds visit the south of England?
4. What are their habits?
5. Which is the most numerous?
6. Where do they breed, and on what do they feed?
7. Are they tameable?
8. Describe the godwit, the stint, and the curlew.
9. Are they met with in flocks?

FISHES.

THE SHARK.

1. The shark is unquestionably the most powerful, active, and most sanguinary of the fishes, only subdued in the ocean by the great toothed whale, not ranking as of the fish tribe. 2. The deadly weapons of the shark are not confined to the teeth, the tail is a formidable weapon, the fins and skin of the animal are also of a cutting or wounding nature; there are, however, so numerous a family that there are no fewer than twelve *subgenera*.

1. Describe the power of the shark.
2. What are its weapons of defence?

THE WHITE SHARK.

1. This aquatic animal of prey has its body covered with tubercled skin, brownish-white above,

and white below; the head is large, has in the upper jaw six rows of hard, sharp-pointed, triangular teeth, in the under jaw four rows, projecting two inches clear of the jaw, which, by means of muscles, can be erected or depressed at pleasure. 2. Nothing can be conceived more terrific than this fish when it appears with open jaws, glaring eyes, its fins agitated and bristling like the mane of a lion.

3. Man, almost inevitably perishes, when within their reach, and their eagerness for food is so great that they leap to a great length to catch a bait.

4. In the West Indies the negroes will sometimes attack the shark, whose power they know to be limited, by reason of the mouth being situated *beneath* the head.

5. They grow to a great size in the tropical seas, sometimes to thirty feet in length, and at Port-Royal, Jamaica, one was caught, a few years ago, which measured thirty-two feet in length.

1. Describe the white-shark.
2. Describe its terrific appearance.
3. What is their general food?
4. How do the negroes attack the shark?
5. What is the size of the white-shark?

THE BLUE-SHARK.

1. THE blue-shark, often found on our coasts, is seldom more than eight feet, with only three rows of teeth in each jaw; but it is considered not full grown, and may, on its return to the tropical seas, acquire great additional size, with the same rows of teeth as the white-shark.

2. Sharks feed mostly on dead whales and small fishes. In swimming, the tail only is used, the rest of the fins serve to balance it.

1. Describe the blue-shark.
2. On what do they feed?

THE LOBSTER.

1. LOBSTERS are very prolific, and, like the crab, cast their shells from time to time. Though differing outwardly, the habits and internal conformation of the crab and lobster are the same.

1. Describe the lobster.

THE CRAB.

1. THE CRAB is for the most part a marine animal, frequenting the rocky shores of the ocean; it has eight, and sometimes ten legs, besides two large claws. 2. The crab feeds on animal matter in a state of decomposition; some of them attack living prey, and fight fiercely in order to procure it. 3. In these combats they often loose their claws, but they soon grow again; but they are never so strong as previously. They have two eyes, and the outer surface is a shell. 4. The jaws are transverse, and the stomach is provided with internal teeth. 5. Some are poisonous, particularly the black kind. 6. The light-coloured and eatable kind form a very pleasant food.

1. Where is the crab found?
2. On what does it feed?
3. What is remarkable in the combat of crabs?
4. Describe the jaws and internal structure.
5. Are there not poisonous crabs?
6. What is to be remarked of the crab as food?

THE SHRIMP.

1. Shrimps have feelers, projecting laminæ, a single-hooked fang to the claws, and have seven joints to the tail, four of which are round and fringed. 2. Vast quantities are taken on our coasts, and are a very delicious species of food.

1. On what does the shrimp feed?
2. Where are they most plentiful?

THE PRAWN.

This is of the same form as the shrimp, but much larger.

THE HERRING.

1. This well-known fish is found in the greatest abundance in the high northern latitudes. It is in general use, and is most estimable as food, whether fresh or cured. 2. The fisheries in various coasts are immense, and of great value. 3. The offspring of a herring, if suffered to multiply unmolested, would, in twenty years, exhibit

a bulk equal to ten times the size of the earth! In winter they retire to the Arctic Ocean.

1. Where are herrings most abundant?
2. Are the herring-fisheries valuable?
3. If the herring race were not checked, what would be the result?

THE FLYING-FISH.

1. THE flying-fish has a great general resemblance to the herring. 2. The wings, by which it contrives to skim through the air for a short time, are nothing more than the large pectoral fins, composed of ribs, and a flexible glutinous membrane. 3. These, whilst wet, enable the fish to move in the air to some distance; but the moment the wings are dry the fish falls without the power of rising again until its wings are moistened.

1. Describe the flying fish.
2. Describe its wings.
3. When the wings are dry what is the state of the fish?

THE SHAD.

1. This fish is caught in the Thames and in the Severn; it has a forked snout, and black spots

on the sides. 2. In the warmer southerly climates the shad is sometimes found three feet in length, but in Europe they seldom exceed eighteen inches, and weigh usually about four pounds; it is rather coarse and insipid. It is an article of wholesome food.

1. Where is the shad found?
2. What is its size?

THE HALIBUT.

1. This fish in the British markets is often more than two feet in length, but in the North sea, where they are abundant, they often measure eight feet; it is the most voracious of flat-fish. The flesh near the side-fins is very fat and delicious.

1. Describe the halibut?

THE PILCHARD.

1. This is a smaller species of herring, and appears in vast shoals off the coast of Cornwall about July and August. 2. So abundant are pilchards on the coast that twenty-five millions

have often been landed, in one day, at a single port. 3. They are thicker than the herring, the eyes whitish-yellow, gill-covers bright yellow, the upper part bluish-green, the sides and belly silvery, and the fins dusky. The dog-fish is its great enemy.

1. Where are pilchards most abundant ?
2. What is the greatest number landed in one day ?
3. Describe this fish.

THE SPRAT.

1. The sprat resembles the herring, but is much smaller, seldom exceeding six inches in length. They are caught near the mouth of the Thames from November to March, and form an excellent and very cheap article of food. 2. They are preserved in various ways, and sometimes sold as counterfeit anchovies.

1. Describe the sprat.
2. Can they be preserved, and for what purpose ?

THE COMMON TROUT.

1. This is a fish of prey, somewhat long in proportion to its breadth, and having a great num-

ber of teeth. 2. The back is ash-colour, the sides yellow, clouded with darker spots of reddish-brown, and the body is prettily spotted with carmine specks during the season, from March to September. 3. In darker water the fish is less brilliant in its colours. They feed on minnows, flies, and worms. It is very wholesome food. 4. The baits are worms and artificial flies.

1. Describe the common trout.
2. What are its colours?
3. What effect has water on their colour?
4. What is their bait?

THE COD.

1. The coasts of Newfoundland, New England, and Nova Scotia, afford *shallows*, which are the favourite situation of this fish, and there it abounds in innumerable quantities. 2. It is so prolific that nine millions of eggs have been counted in the roe of a single cod-fish.

1. Where is the cod most abundant?
2. How many eggs have been found in the roe of one fish?

THE WHITE-BAIT.

1. This small and exquisitely delicate fish is found in great quantities in the Thames, at particular seasons, and is supposed to be of the carp genus. Greenwich and Blackwall are famous for their culinary preparation of this minute fish.

1. Where is the white-bait found, and of what genus is it?

THE SEAL.

1. These amphibious animals are found in great numbers off the coast of Greenland, and defend themselves vigorously when attacked. 2. The seal produces a considerable quantity of valuable oil.

1. Describe the seal.
2. What is its use?

THE SALMON.

1. This fish is caught in the fisheries, of vast size, the back and sides generally grey, the belly

silvery, nose thick, and the lower jaw of the male turns in the form of a hook. 2. The favourite places of resort of the salmon are clear water, rapid and stony rivers. 3. It lives both in fresh and salt water, going up the rivers in autumn, in order to deposit its spawn. In the ensuing spring the ova are hatched. 4. The salmon fisheries of Great Britain, of Coleraine, in Ireland, and of Christiansand, in Norway, are very considerable. This fish was much esteemed by the Romans, but unknown to the Greeks.

1. Describe the salmon.
2. Where is its favourite resort?
3. Is it confined to fresh water?
4. Where are they most abundant?

THE GURNET.

1. There are five sorts of this fish, the common, the grey, the red, the sapharine, and the flying. 2. The head of the gurnard, or gurnet, is large, and the tail small. The colours are very brilliant, particularly of the kind called "sapphirine," and also of the "flying gurnet," which last is frequently found in the Mediterranean, the Atlantic, and Indian seas. 3. These fish are

carnivorous; and are armed with spines, with which they defend themselves. The gurnet feeds on crabs and muscles, which it obtains from the bottom of the ocean.

1. How many sorts of gurnet are there?
2. Describe the fish.
3. On what do they feed?

THE ROACH.

1. This is a handsome fish, with large eyes, the circle round of a golden colour, and the iris pink-red; it is chiefly found in deep and still rivers, and feeds on aquatic plants and worms. The best time for angling is in mild cloudy weather; and the best baits are flies, paste, or worms. 2. It is exceedingly bony, but the flesh is wholesome, and esteemed by many.

1. Describe the roach.
2. What is the quality of this fish?

THE HADDOCK.

1. The haddock is a species of cod, sometimes fourteen pounds weight, and is caught in immense

shoals off the coast of Yorkshire. 2. They feed on marine animals, and devour the herring with great avidity.

1. What is the size of the haddock?
2. On what do they feed?

THE SMELT.

1. THIS little fish has the odour of cucumber, and is much esteemed. It is caught in quantities off our coasts. 2. Sometimes it is called "sparling."

1. Describe the smelt.
2. By what other name is it known?

THE PIKE.

1. THIS is one of the most voracious of fish. The opening of the jaws is remarkably wide, owing to a peculiar construction of the bones, like that of a viper. 2. They are solitary, excessively daring, will prey upon each other, and have been termed the tyrants of the fresh water. 3. Pikes are usually *trolled* for; they are prolific, and are tolerably good as an article for the table. The head is long, the back broad, their colour is green, spotted with bright yellow.

Some have been caught, weighing fifty pounds; but their usual weight is from two to six pounds. 4. The pike is said to attain great longevity; the age of one mentioned by Gessner, is said to have been 267 years.

1. Describe the pike.
2. On what do they prey?
3. What is the size of the pike?
4. Is the pike long-lived?

THE STICKLEBACK.

1. This fish is common in our rivers, and seldom exceeds two inches in length. 2. They have three sharp spines in the back; are very detrimental to other fish, and are unfit for food.

1. Where is the stickleback found, and what is its size?
2. Describe their destructive habits

THE MULLET.

1. The mullet is a delicious fish, thicker than the dace, and much longer. They are red or grey. 2. The red-mullet was much esteemed by the Romans, and one sold, in the time of Horace, for £64 11*s.* 8*d.* of our money! 3. They are plentiful on our coasts, and are caught with nets,

but with some difficulty, for they are very cunning, and sometimes a shoal will make their escape by leaping over the nets. 4. The changing of colour in this fish on dying is very extraordinary.

1. Describe the mullet.
2. What ancient nation particularly esteemed it?
3. Where are they plentiful, and how do they attempt to escape the nets of the fishermen?
4. What is remarkable on their dying?

THE ELECTRIC EEL.

1. THIS is a very remarkable fish, and, in appearance, resembles the common eel. On touching it, it produces the same effect as an electric shock. 2. There is one now exhibiting at the Royal Adelaide Gallery, London. It is kept warm, and the water is changed once a day. 3. In Surinam it is killed with a club, to destroy its electric properties before it is touched, and is then eaten. 4. This fish is sometimes twenty feet in length, the shock from it has been known to cause instant death to the person who receives it. 5. They live on fish, worms, or other animal food; when preying on fish the electric eel gives a shock which kills or stupifies its intended victim. 6. They can only swallow small

fish; an eel, of three feet, can swallow with difficulty a fish three inches long.

7. A negro, on one occasion, endeavoured to lift a large fish which had been landed, but the shock was such as to occasion confirmed paralysis in both his arms. 8. A sailor attempted a similar feat by grasping the fish with both his hands, but the moment he received the electric shock he fell down in a fit, his eyes fixed, his face became livid, and it was with great difficulty that his senses were restored. 9. He stated, that the instant he touched the fish the cold ran quickly up his arm into his body and pierced him to the heart.

1. What is remarkable in this eel?
2. Where is there a specimen?
3. Where are they killed with a club?
4. What is its size, and the effect of its shock?
5. On what does the electric eel feed?
6. What size fish can they swallow?
7. Describe the effect on a person lifting this eel.
8. What was the effect on a sailor?
9. What sensation did he state took place?

THE DACE.

1. This is a lively fresh-water fish; is exceedingly prolific, and affords much sport to the

angler, whose baits are worms, flesh-flies, and gentles. 2. The season extends from April to the following February. 3. The body is slender; the colour of the back a yellowish green, the sides and body silvery.

1. Describe the dacc.
2. What is their season?
3. What are their colours?

THE PERCH.

1. The back of this fish is much arched, the body deep, the scales rough, the sides golden, the teeth small, the gills serrated, and on the lower end of the largest is a sharp spine, the back and part of the sides are green, varied with black bars; beneath, it is white, shot with red, and the ventral and anal fins and tail are scarlet. 2. This fish is extremely voracious; it swims in shoals, and is slow of growth. 3. The usual weight is from half a pound to two pounds.

4. Perch afford much diversion to the angler from April to January; the baits being blood-worms, with three or more hooks on a line, which should be kept in motion.

1. Describe the perch.
2. Is this a voracious fish?

3. What is its usual weight?
4. What is the season for fishing perch?

THE DORY.

1. In shape this fish resembles a flounder; it is armed with sharp points on the back fin; it is from eight to eighteen inches in length, and sometimes weighs as much as twelve pounds. 2. This fish is much esteemed; it is found in the Mediterranean, and in the German ocean.

1. Describe the dory.
2. Where is it found?

THE CARP.

1. The tail of this fish is forked; it is toothless; the colour is yellow on the back, inclining to blue and green, the under part being whitish. 2. They are found in slow rivers and stagnant waters, and when largest do not exceed four feet in length and twenty pounds in weight. 3. Carp is described as being remarkable for longevity—some being above two hundred years old. 4. They multiply fast, and feed on aquatic plants, insects, and worms. Ponds near the sea, in which the water is brackish, are best suited to this fish. 5. The old ones are extremely cunning, and try

the angler's patience much. Marsh worms form an excellent bait.

1. Describe the carp.
2. Where is this fish found, and what is its length?
3. Do they live many years?
4. Are they prolific, and on what do they feed?
5. Describe the habits of the fish, and the best bait.

THE BARBEL.

1. The colour of the back is pale olive, and beneath, it is silvery. The back is arched, the tail forked, the fins rayed. 2. They are found in the Thames, and the season for fishing is from May to September.

1. Describe the barbel.
2. What is the season for fishing?

THE ANCHOVY.

1. This fish is three inches long; the nose is sharp, the tail forked. 2. The great fishery is at Gorgona, near Leghorn, where they are taken in nets, into which they are allured by lights fixed to the stern of the vessels. They are gutted, salted, and packed for exportation.

1. Describe the anchovy.
2. Where is this fish found, and how are they caught?

THE BLEAK.

1. This is sometimes termed the fresh-water sprat. It is silvery and pellucid; the tail is forked; and it is a very restless fish. In length it is from two to five inches.

1. Describe the bleak, or fresh-water sprat.

THE GUDGEON.

1. The body of this fish is round, and the gill-membrane has six spines. 2. It feeds on insects, and takes a bait, blood-worms or gentles, readily. The season is from spring to autumn.

1. Describe the gudgeon.
2. On what does it feed?

THE TURBOT.

1. Like other flat-fish, the turbot grows to a great size. The upper part resembles wet mud or sand in appearance, the under part is silvery white; they swim sideways. 2. The principal British fishery is on the coast of Yorkshire. 3. Some have been taken in our seas, weighing

from one to three hundred pounds; but much larger are found in Newfoundland, Greenland, and Iceland.

1. Describe the turbot.
2. Where is our great turbot fishery?
3. What is the weight of the largest?

THE BREAM.

1. This is a broad fish with a small head. The back is a bluish black, the sides yellow, and beneath it is red. The tail is large; the flesh coarse. 2. It prefers deep water, and is abundant on the shores of the Channel Islands.

1. Describe the bream.
2. Where is it principally found?

THE SALMON TROUT.

This fish is so called, from its resemblance to the salmon, and weighs, sometimes, as much as ten pounds. 2. It does not quit the sea so early as the salmon, and is not seen in rivers until May. It is preserved by salting and smoking.

1. Describe the salmon trout.
2. When does it leave the sea for the rivers?

THE GAR-FISH.

1. This fish belongs to the class of needle-fish, and is found in the North and Baltic seas. It is very long in proportion to its thickness.

1. Describe the gar-fish.

THE PIPE-FISH.

1. This fish belongs also to the same family as the gar-fish.

1. Describe the pipe-fish.

THE SOLE.

1. This well-known fish is caught in great quantities off the northern coasts. In shape it is flat and thin.

1. Describe the sole.

THE SKATE.

1. The skate has a rough back, with a single row of spines on the tail; the skin is black, and, when dried, is used in polishing wood and ivory.

2. It is very voracious. It is much relished for the table.

1. Describe the skate.
2. Is this fish voracious?

THE THORNBACK.

1. This fish has spines disposed in three rows on the back; the mouth is transverse, the tail long and slender.

1. Describe the thornback.

THE COMMON EEL.

1. The body of this fish is cylindrical, smooth, and slippery. 2. It will frequently, at night, wander over meadows to other pieces of water; and it prefers muddy and quiet localities. 3. Eels are viviparous, and are in season from May to July. They are very tenacious of life.

4. They are fished for in various ways, by night-lines, bobbing, sniggling, and with the rod and line. Wasp-grubs, dew-worms, minnows, and gudgeons, are the best baits.

1. Describe the common eel.
2. Does this fish ever leave the water?
3. When are eels in season?
4. What is the best bait?

THE OYSTER.

1. This is a bi-valve shell-fish, well known in most countries; they cast their spawn in April. 2. The fisheries on the coasts of England and France are very extensive and valuable. It forms delicious food. 3. Oysters frequently contain *pearls*, and there are diving establishments, for the purpose of obtaining them, at Oran, and in other parts of Asia, and in America.

1. Describe the oyster.
2. Where are the best fisheries?
3. Are not pearls found in oysters, and where are the best pearl oysters?

THE MUSCLE.

1. The muscle is one of the most common of shell-fish, and is esteemed as food, although, on some constitutions it produces a very unpleasant effect. 2. A mixture of olive-oil and lemon-juice is the best remedy in this case. *Pearl* muscles have a peculiar concretion; but it is small and of little value.

1. Describe the muscle, and its effect on some persons.
2. What is the best remedy for this disorder?

THE STURGEON.

1. THIS is a formidable fish, both as to size and appearance, but is perfectly harmless; it has five rows of large bony tubercles from head to tail; is from six to eighteen feet in length, and hides among the weeds, near the sea-shore, where the tendrils of the head being mistaken for worms, many fish become unconsciously its prey. 2. It is toothless, but voracious, and sucks down the fish within its reach.

1. Describe the sturgeon; on what does it feed?
2. How does it attack fish?

THE WOLF-FISH.

1. THIS is a very ravenous and fierce-looking fish, and is found in the northern seas. It is sometimes called the "sea-calf." 2. The head is flattened; the nose short; the teeth numerous and strong; and the body is long, sometimes extending to four feet. 3. It feeds chiefly on shell-fish, and is full of roe from February to April. 4. The Yorkshire fishermen eat it, after divesting it of the head and skin.

1. Where is the wolf-fish found?
2. Describe the fish.

3. On what does it feed?
4. Is it used as food?

THE SEA-HORSE.

1. This fish is found in the Mediterranean and Western Ocean, and in the East Indies. It is speckled, is about nine inches in length, and the head resembles that of a horse.

1. Describe the sea-horse, and its locality.

THE FLOUNDER.

1. The colour of this fish is a pale brown; they swim in shoals, bite freely at lob-worms, and minnows, and are much sought after for food. 2. They spawn in May and June, and are in season the remainder of the year.

1. Describe the flounder.
2. When are they in season?

THE DAB.

1. The dab is brown above and white beneath, and is in season from February to April; it has a very agreeable flavour.

1. Describe the dab.

1. PLAICE are flat and flounder-shaped; the best are taken off the coast of Sussex; they spawn in February, and are not much esteemed as an article of food, being very watery.

1. Describe the plaice.

THE SWORD-FISH.

1. THIS fish has a long hard sword-shaped upper jaw; the mouth has no teeth, and there are no scales. 2. They are large, powerful, and voracious, and attack, with their horny proboscis, all that comes within their reach. 3. The force with which they run against, and penetrate objects, even the bottoms of ships, is prodigious. They are sometimes twenty feet long.

1. What is remarkable in the sword-fish?
2. Are they ferocious?
3. What is their length, and what effect have they against the bottom of ships?

THE PIPE-FISH.

THIS belongs to the same family, needle-fish, as the *gar-fish*, of which a description is given elsewhere.

THE SCHAD, OR HORSE-MACKEREL.

1. THIS fish varies from seven inches to two feet in length, and is exceedingly voracious. 2. It is found near Keil, on the coast of Holstein, in a condition fit for food, and is there esteemed. On our coast, and in the Mediterranean, where it is larger, it is deemed coarse.

1. Describe the schad.
2. Where is it found?

THE CHUB.

1. THIS is a handsome fish, but is not in esteem for the table; the head and back are a dusky green, the sides silvery. 2. It bites eagerly at worms or artificial flies, in mild cloudy weather, during the winter months.

1. Describe the chub.
2. How is it caught?

THE MACKEREL.

1. THE shape of this fish is very perfect, and its colours, blue, green, and silvery-white, have a very beautiful appearance. 2. It is voracious, and found in the German ocean, Baltic, and Mediter-

raneau. 3. The usual weight is from one to two pounds. 4. On the west coast of England there is a great fishery for mackerel, which is exceedingly valuable. As an article for the table it is rich, yet delicate.

1. Describe the mackerel.
2. Where is it found?
3. What is its weight?
4. Where is the English mackerel fishery?

THE WHALE.

1. The whale, is the largest of aquatic animals, and one of the most harmless and valuable; its form and its habits are familiar to most persons. 2. It is of the cetaceous order, produces its young alive, and is sometimes found, in the northern seas, ninety feet in length. 3. The *whalebone* is placed in the inside of the mouth, and is attached to the upper jaw. 4. The whale has no fin on the back; has small eyes, a very small gullet, and is quick of hearing. 5 The female usually produces *one* young one after an interval of nine months, which remains a year at the breast. 6. It has the power of spouting water to a considerable height, and the tail is a most powerful weapon of defence. 7. The

whale fisheries of this kingdom are of a very great value, and much capital is embarked in them. 8. That which centres in the port of Hull, as a deposit for the *blubber* brought from the northern and southern seas, is on a very large scale.

1. Describe the whale.
2. How does it produce its young?
3. Where is the whalebone found in the fish?
4. Describe its fins, eyes, gullet.
5. How many does the whale produce at a birth, and how long does the mother suckle her young?
6. What is remarked on the spouting of water, and the tail as a weapon?
7. Are the whale fisheries valuable?
8. Where is the blubber deposited when brought from the North and South Seas?

THE ALLIGATOR.

1. This large and dangerous reptile is a native of Carolina, Louisiana, and other southern States of the Union, and of many parts of South America. 2. There are several species, known under the names of "Cayman," "Jacard," &c., &c., among the Portuguese, Spaniards, and Indians; but the name *alligator* is that alone by which they are known among naturalists.

3. Baron Cuvier considers alligators not as a distinct genus, but as forming a sub-genus of crocodiles with which they agree in their structure and habits, though they differ in the choice of their locality.

4. The head of the alligator is broader than that of the crocodile; the teeth have a peculiar protrusion; the feet are rounder, and unfringed; the toes are not completely webbed, and the *post-orbital* holes on the cranium are very minute, whereas those of the crocodile are particularly conspicuous. 5. The natural armour of these animals is an astonishing provision of nature for their defence, and is so hard and tough as to repel a musket-ball. 6. The length is usually about eighteen feet; the voice is loud and piercing; and the flesh, which is eaten by the Indians, has a musky taste. 7. They lay sixty or seventy eggs, which they leave to be hatched by the sun: but not above one-third produce young, for vultures and other enemies are abundantly watchful for the opportunity to feed upon them. 8. The alligator is excessively voracious; and an instance is recorded of a young woman having been drawn under water by one of them, as she was bathing her feet. She had only been married that morning; and the husband, hearing what had occurred dived after the monster, at-

sometimes as many as fourteen. The noise they make is an unpleasant croak. 7. On the Continent a larger description of frog is much sought after for food, the flesh of which is extremely white and delicate, more particularly that of the hind-leg. This kind of frog is very voracious, and will seize upon birds and mice. 8. The bull-frog is common to Virginia and other parts of America; it is of a very large size, and the noise it makes resembles that of a bull; indeed, its croaking is incredibly loud, considering the size of the animal.

9. The tree-frog—a rather elegant little animal—is found in America, and in many parts of Europe, but not in Great Britain. The upper part is green, with a longitudinal violet-coloured streak on each side. 10. At the end of each toe is an apparatus like the mouth of a leech, which facilitates its adherence to objects. 11. During the summer months it resides among the upper branches of trees, along which it wanders in search of insects—springing upon its prey with great rapidity. During the winter it retires to the mud of ponds.

1. What is the appearance of the frog?
2. Where are they found?
3. Describe its organs of respiration.
4. What is the number of eggs?

5. On what does the young frog feed?

6. What is the period of full growth, and what is remarkable in casting their skins?

7. Where are they used as human food, and on what does that species of frog feed?

8. Where is the bull-frog found?

9. Where is the tree-frog to be found, and what is its colour?

10. How does it ascend trees?

11. Where does it reside in summer and in winter?

THE COMMON RINGED SNAKE.

1. There are two hundred and thirty species of serpents, of which forty are poisonous. These last have long tubular fangs on each side of the head, which convey venom from the receptacle at the base into the wound that results from the bite. 2. Venomous serpents have two rows of teeth in the upper jaw—the other kind have four rows. The ringed is the most common kind of snake, in various parts of the world, and is not unfrequently found in this country: it is sometimes four feet in length. On the back and sides are small scales, and the teeth are serrated. 3. They are perfectly inoffensive, and shelter themselves in dunghills, and among bushes, basking in the sun during the warm part of the day. In the spring they cast their skins completely. 4. The

female deposits her eggs, about fifteen in number, in holes fronting the south, or in dunghills. 5. They are in size about as large as those of the blackbird, and are hatched in the following spring. This snake may be tamed, and will hunt rats and mice. It is free from any offensive odour, and except when a cat or dog, or any animal that it fears, is admitted into the room, it then emits a most intolerable effluvia. 6. It is, however, extremely courageous when attacked. Like all of its species it is very fond of milk. 7. It combats the rattle-snake; will pursue rats and mice, and is frequently domesticated.

1. How many species of snakes are there, and how are they divided?
2. How are the venomous distinguished?
3. What is to be remarked on the ringed-snake?
4. Where does the female deposit her eggs?
5. What is their size?
6. How does it act when attacked?
7. Can the snake be tamed?

THE COMMON LIZARD.

1. This is an exceedingly harmless reptile, and is about six inches in length. The colour is a mixture of light brown, white, and black: the

under parts of the body being of a dull white. The tail tapers, and, from the weakness of the vertebræ, is very brittle. Its motion is exceedingly swift, so that almost as soon as seen, it disappears. 2. It is fond of basking in the sun when the day is not too hot; and exhibits the pleasure which it feels beneath this reviving warmth, by the sparkling brilliancy of its eyes. It feeds upon insects and minuter animals, and sometimes carries off the young of birds. 3. It can exist for a long period without food, and may be kept in a bottle for six months, and will still be alive; but this is a very cruel experiment. 4. In May the female lays her eggs in such a situation as that the sun may hatch them. During the winter, lizards remain in a torpid state.

1. Describe the common lizard.
2. What are its habits?
3. How long can it exist without food?
4. Where does the female deposit her eggs for hatching; and what is their state in winter?

THE BOA-CONSTRICTOR.

1. This is the largest and strongest of the *serpent* tribe. The colour generally is a greyish yellow, marked with reddish interchained spots:

the tail and belly being covered with undivided plates. 2. It is found in Asia, Africa, and in Southern America. The length of this serpent is sometimes as much as forty feet, and it is of proportionate thickness; the power, therefore, which it possesses of crushing its prey, by coiling itself around it, is almost incalculable. 3. The readiest mode of killing this serpent is by shooting it, aiming always at the head. It is then usually tied up to the branch of a tree, by the natives of India, and skinned. 4. Stags, buffaloes, and even tigers, frequently fall a prey to this ravenous serpent, which, having killed its prey, licks the body all over, so as to cover it with mucilage, and then begins the process of swallowing it whole. 5. The skin is surprisingly distended by this means, and the serpent, being in a state approaching to torpidity while the act of digestion is in progress, may be easily destroyed. 6. There are several specimens of a small size in the various zoological gardens of this country; but they are exceedingly torpid, as the climate and the confinement do not agree with them.

1. Describe the boa-constrictor.
2. Where is it found?
3. How do the Indians destroy them?
4. What are the animals on which the boa generally subsists?

5. After eating what is the state of the boa-constrictor?
6. What is their state in this country?

THE COBRA DI CAPELLO.

1. Of this most dangerous serpent we cannot refrain from giving some account. It is a native of India, and is, when full grown, about eight feet long, and an inch in thickness. Its bite is fatal, almost immediately; it is hooded, and tapers towards the tail. 2. The following anecdote, from the *Madras Herald*, gives an account of a very singular adventure with a *cobra di capello*, on the part of a gentleman who was reposing under a tamarind tree alone, after a day of shooting:—
"I was aroused by the furious baying of my dogs. On turning round I beheld a snake, of the *cobra di capello* species, directing its course to a place near me. In an instant I was upon my feet. The moment the reptile became aware of my presence, it boldly gazed at me with expanded hood, eyes sparkling, neck beautifully arched, the head raised nearly two feet from the ground, and oscillating from side to side in a manner plainly indicative of a resentful foe. I seized a short bamboo, left by one of the bearers, and hurled it at my opponent's head. I was for-

tunate enough to hit it beneath the eye. The reptile immediately fell from its imposing attitude and lay apparently lifeless. Without a moment's reflection, I seized it a little below the head, hauled it beneath the shelter of the tree, and very coolly sat down to examine the mouth for the poisonous fangs, of which naturalists speak so much. While in the act of forcing the mouth open with a stalk, I felt the head sliding through my hand; and, to my utter astonishment, became aware that I had now to contend against the most deadly of reptiles in its full strength and vigour. Indeed I was in a moment convinced of it; for, as I tightened my hold of the throat, its body became wreathed around my neck and arm. I raised myself from a sitting position to one knee; my right arm, to enable me to exert my strength, was extended. I must, in such an attitude, have appeared horrified enough to represent a deity in the Hindoo mythology, such as we often see rudely emblazoned on the portals of their native temples. It now became a matter of self-defence. To retain my hold it required my utmost strength to prevent the head from escaping, as my neck became a purchase for the reptile to pull upon. If the reader is aware of the universal dread in which the *cobra di capello* is held throughout India, and

the almost certain death which invariably follows its bite, he will, in some degree, be able to imagine what my feelings were at that moment; a shudder, a faint kind of disgusting sickness pervaded my whole frame, as I felt the cold, clammy fold of the reptile's body tightening round my neck. To attempt any delineation of my sensations would be absurd; let it suffice, they were most horrible. I had now almost resolved to resign my hold. Had I done so, this tale would never have been written; as, no doubt, the head would have been brought to the extreme circumvolution to inflict its deadly wound. Even in the agony of such a moment I could picture to myself the fierce glowing of the eyes, and the intimidating expansion of the hood ere it fastened its venomous and fatal hold upon my face and neck. To hold it much longer was impossible. Immediately beneath my grasp there was an inward working and creeping of the skin, which seemed to be assisted by the very firmness with which I held it; my hand was gloved. Finding, in defiance of all my efforts, that my hand was each instant forced closer to my face, I was anxiously considering how to act in this horrible dilemma, when an idea struck me that, were it in my power to transfix the mouth with some sharp instrument, it would prevent the

reptile from using its fangs, should it escape my hold of it. My gun lay at my feet, the ramrod appeared the very thing required, which, with some difficulty I succeeded in drawing out, having only one hand disengaged. My right arm was now trembling from over exertion, my hold becoming less firm, when I happily succeeded in passing the rod through the lower jaw up to its centre. It, was not without considerable hesitation that I suddenly let go my hold of the throat, and seized the rod in both hands, at the same time bringing them over my head, with a sudden jerk, disengaging the fold from my neck which had become almost tight enough to produce strangulation. There was then little difficulty in freeing my arm, and ultimately throwing the reptile from me to the earth, where it continued to twist and writhe into a thousand contortions of rage and agony. To run to a neighbouring stream to lave my neck, hands, and face, in its cooling waters, was my first act after getting rid of my formidable enemy."

1. Describe the cobra di capello, and where it is found.
2. Relate the anecdote of the cobra di capello.

THE BLINDWORM.

1. This, though formidable in appearance, is a harmless reptile. It is about eleven inches in length, and is marked on the back with very small black lines composed of specks. 2. Its motion is slow; it lies in a state of torpidity during winter, and brings forth its young alive.

1. Describe the blindworm.
2. What is its state during winter?

THE RATTLE-SNAKE.

1. When this reptile is in the act of biting, it forces the fatal poison from a gland at the root of moveable fangs in the upper jaw. The colour of the back is a yellow-brown with cross-bars of black; and it has a *rattle* loosely-jointed in the tail, which begins to form after the first year. 2. The odour of this reptile is horribly fetid; its tongue is forked, and it swallows its prey whole. Its eyes are terrifically bright, and their glance is fatal to birds, squirrels, and other small animals, on which it may be fixed, and they usually give themselves up without attempting to escape. 3. Even dogs, hogs, and man himself, evince the utmost terror when near this very formidable

enemy; and the Indians, with all their sagacity, avoid the woods in rainy weather, because, at that period the rattle-snake does not give warning by means of its rattle. 4. The young, about twelve in number, are usually produced in June, and by the beginning of October are about eleven inches in length. In order to protect her young, the female receives them into her mouth, and swallows them; and the viper does the same. 5. This snake moves with its head on the ground; but if it be alarmed it coils itself into a circle and erects the head, while its eyes assume a most terrific expression.

6. The poison of this reptile usually proves fatal in a very short period of time, however slight the puncture may be. If irritated, and unable to vent its rage upon any other object, it will turn upon itself, and very shortly dies of its own sting. 7. The Indians of America contrive to divest the snake of its fangs, and then feast upon it, its flesh being considered both delicate and nutritious. 8. In America they may be seen in pairs; but in winter they congregate in great numbers, and seek warmth by huddling together under ground. They come out whenever tempted by the mildness of the weather, or by a fire lit near them.

9. Two settlers, a farmer and his wife, having

taken possession of a log-house, near Buffalo, after having made a fire in their sleeping apartment retired to rest. About an hour afterwards the husband rose in order to replenish the fire, when he was surrounded and stung to death by a thousand rattle-snakes. His loud and agonizing cries awoke his wretched wife, who had only time to cover herself with the clothes of the bed in order to protect herself. In the morning, as no smoke was seen to rise from the chimney, the neighbours, who, in such places, are solicitous to provide for the wants of each other, began to imagine the worst and fortunately rescued the unhappy wife. The husband was mangled in the most frightful manner, and it is difficult to conceive any thing equivalent to the torture of mind which she must have experienced on that fatal night!

1. From whence is the poison of the rattle-snake emitted?

2. Describe this reptile.

3. What feeling do they excite when first seen by other animals?

4. What is the general number of their young?

5. How does it move?

6. What are the effects of its poison?

7. What use is made of the snake by the American Indians?

8. What is their state in winter?

9. Relate the anecdote of the farmer and his wife.

THE CAMELEON.

1. The general appearance of this animal is extremely uninviting; but it is nevertheless perfectly harmless, and feeds only upon insects, for which its tongue and tubular lip are well adapted. 2. The feet have five toes, and the tail is usually coiled round the nearest branch, so as to give it a firm hold. The eyes are so constructed that it can make use of either separately; so that it is frequently seen to look two ways at once; and it is also enabled by the conformation of the lungs to inflate its body to an immense size. 3. As to its *changes of colour*, about which so much has been said, they are very limited. His usual colour is an iron-grey, which becomes a yellow, or yellowish-green, sometimes speckled, when it is disturbed or excited. It never becomes red, blue, or purple, and, before its change of colour, inflates itself to twice its ordinary size, gradually changing as the inflation subsides.

1. What is the appearance of the cameleon?

2. Describe the feet and eyes of this animal.

3. What may be remarked on the changes of colour which they undergo?

THE CROCODILE.

1. The tail of this formidable reptile is two-edged, and in the jaws are about forty, sharply-pointed teeth on either side. Its eyes are large, fiery, projecting, but immovable; and they therefore move in a straight line. The mouth is of immense size like that of the alligator, and the body is defended by strong and elaborate scales. 2. It is common in Africa and in India, and seldom leaves the water unless to seek food, or deposit its eggs. 3. The female hides her eggs, to the number of about a hundred, in the sand, and they are hatched by the sun in thirty days, when the young run at once into the water. 4. These eggs are about the size of those of a goose; and fortunately become the prey, by hundreds of thousands, of vultures, and other animals of prey; and they are also sought after by the natives, who esteem them as food. 5. The crocodile is exceedingly timid, always disappearing at the sight of a human being.

1. Describe the crocodile.
2. Where is it found?
3. Where does the female deposit her eggs?
4. What is the size of the eggs, and how are the number of crocodiles diminished?
5. Are they daring in their manner?

BOOK II.

THE VEGETABLE KINGDOM.

INTRODUCTORY REMARKS.

1. The vegetable productions of nature contribute to the beauty of the surface of the globe, as well as to the subsistence of the animal world. 2. From the tallest tree to the lowliest flower, all convinces us of the inexhaustible wisdom and goodness of God, who has so bountifully provided all things necessary for the multitude of beings whom he has created.

1. What is the use of the vegetable kingdom?
2. What does it evince to us as to God's providence?

AGRICULTURE.

SOURCES OF FOOD.

1. The *cultivation of the land* has always been considered one of the most important duties of man; for without it we should not be able to exist. It is from the land that we obtain *corn*, from which *bread* is made; and the cattle which furnish us with *meat* are fed upon grass and other products of the land.

2. Land is divided into five kinds, namely—

3. I. Arable, which produces, corn, turnips, &c.

II. Grass land, which produces different kinds of grass.

III. Wood-land, which produces trees and bushes.

IV. Common pasture, which produces the best kinds of grass for cattle, including clover and other plants.

V. Waste. This term is usually applied to land not in a state of cultivation; although, if cultivated, it might produce valuable crops.

4. On looking over the list of these *five* different kinds of land, it will be perceived at once that No. 1. is the most important.

We will now examine a little into the earth itself, from whence all these productions spring forth; and as we must make use of some terms with which the young reader may not be familiar, we will explain them by means of *notes* as we proceed.

5. If the earth be dug up with a spade, it will be found to vary in texture and colour at different depths. A line, parallel to the surface, marks the depth of the upper SOIL, and separates it from the SUBSOIL.*

6. The SOIL is composed of minute parts of various kinds of earths, mixed with animal and vegetable substances in different states of decomposition,† To such a cause it owes its colour, which is usually darker than that of the SUBSOIL.‡

* *Sub-soil,* that is, the soil below the upper soil. The upper soil forms the surface of the earth.

† *Decomposition,* that is, animal and vegetable substances in what we commonly call a *rotten* or *decayed* state.

‡ Atmospheric air, that is, the air we breathe, is composed of certain *gases,* of which OXYGEN GAS is one. Now this gas produces some curious effects on metals, provided the said metals have an "*affinity* for oxygen," that is, are disposed to be affected by it. *Iron,* for instance, is easily affected by oxygen, and the *rust* of iron, is *oxide of iron.*

7. The earths alluded to are chiefly clay, flint, and lime. 8. Of metals, IRON, in the state of per-oxide, is abundant near the surface. 9. Saline substances are not in any great quantity, but very important.

*Potassa** exists in all vegetable matters ; *soda* in few ; and *ammonia* is procured by decomposition, and is very volatile.

10. The *vegetable* and *mineral acids* are also found in combination ; and a knowledge of these saline substances is absolutely requisite as a means of correcting other substances for which they have an affinity.

11. Water, in combination, or mechanically diffused,† is necessary to *all* plants as a means of growth. Without water and atmospheric air, there can be no life, animal or vegetable.

12. Clay or *alumina*, is the basis of all the strong heavy soils ; and is obtained in its purest form

* Potassa, soda, ammonia, vegetable and mineral acids. It may be remarked here, that philosophers consider *all* EARTHS to be OXIDES *of peculiar metals*. Sir Humphrey Davy, who discovered several new metals, was of this opinion.

† Water may exist in earths, or other matters *combined* with them, and unseen ; or it may be visibly spread and diffused among them.

from alum, in which it is combined with sulphuric acid.*

13. *Silica*, or the earth of flints, suffers no change in water, and forms, according to size, gravel or sand. Sand holds water in its interstices by cohesive attraction.

14. Clay improves light sands, and sands correct the tenacity of clay. 10. *Carbonate of lime* has an excellent effect on soils generally: and, indeed, no soil can be very productive without it.

15. All *lime-stone* is, properly, *carbonate of lime*. As it neutralizes and destroys the noxious qualities of acids in a soil; a proper mixture of clay, flint, and lime, duly divided, forms *loam*, or the best kind of soil for vegetable produce.

16. There are, however, some soils which contain, in addition, a larger proportion of *natural manure*, which renders them more than ordinarily fertile. 17. This substance has received the name of HUMUS, and is dark, unctuous, and friable, composed of oxygen, hydrogen, nitro-

* *Sulphuric acid*. This is commonly called *oil of vitriol*, when in a liquid state. It is manufactured in large quantities, and is used extensively for various purposes.

gen, and carbon.* 18. It is a result of the slow decomposition of organic matter in the earth, and is found in rich garden mould and very old dunghills.—It *cannot* be produced chemically.

19. The greatest enemy of HUMUS is stagnant water, which turns it *sour*, as in the case of *peat*.† The remedy is, draining, and lime, when abundant fertility may be expected.

20. In CULTIVATING the land, the PLOUGH is an instrument of absolute necessity, and should, as much as possible, imitate the work done by a *spade*; for spade-husbandry would be the best, were it not impracticable, by reason of its expense.

21. The plough forms a small furrow between the tops of the ridges, well adapted for the seed to lodge in, and to be easily covered by the harrows.

* Oxygen has been already described. Hydrogen and nitrogen are both gases, and the former is used for lighting streets and shops, as it is of an inflammable nature. If wood be put into a close vessel over the fire, it becomes *charcoal*; and charcoal is *carbon* in a solid state.

† *Peat* is found in large quantities in Cumberland, and other English counties, and in Ireland. It is dug up and put into moulds rather larger than a brick; and after it becomes dry, it is used as fuel. It produces great heat.

Various kinds of *harrows*, and also *rollers* and *drills* are used in the cultivation of land.

22. We have thus given some idea of the *soil*, which produces us our daily food, and is the source of all our comforts and luxuries; and we will now say a word or two respecting the *rotation*, or *changing* of *crops*, as it is a subject of which we should all of us have some general knowledge.

23. A judicious rotation of crops is of the highest importance, for it has been proved that the HUMUS becomes exhausted by vegetation, and that as *each crop produces a specific effect on the ground*, no management can bring forth repeated crops of the same grain. 24. There must be the intervention of other crops. 25. The best rotation for strong alluvial soil, is wheat and beans alternately, as in some parts of Germany; and on light poor lands, turnips and barley alternately; the turnips to be fed off by sheep folded on them. 26. In this case there may be an occasional variation of clover. The Norfolk rotation is, first, turnips, manured; then barley; then clover; then wheat; and by such means there will be a sufficiency of food for sheep and cattle; and as the land will be amply manured every four years, it will be in a state of regularly progressing improvement.

27. No cultivator should be too anxious to *force* crops, or he will assuredly repent it; and he should be unceasingly attentive to keeping the soil *clean* by *weeding*, and should also see that it is amply, but judiciously, manured.

1. What are the results of agriculture?
2. How many sorts of land are there?
3. Describe arable land, grass land, wood land, common pasture and waste land respectively?
4. Which is the most valuable?
5. Describe the upper and subsoils.
6. Of what is soil composed?
7. What are the earths alluded to?
8. Where is iron most abundant?
9. Ccscribe saline matter.
10. How are vegetable and mineral acids found?
11. What is the utility of water?
12. Describe clay.
13. Describe silica.
14. What does the mixture of clay and sand produce?
15. What is the use of lime in agriculture?
16. What soils contain most fertile earths?
17. What is that substance called?
18. Where is it generated?
19. What is the greatest enemy to humus, and how is it remedied?
20. What is to be remarked on spade husbandry?
21. What other instruments are used?
22. What benefits result to man from agriculture?
23. What is to be remarked on the rotation of crops?

24. Will the same rotation of crops be beneficial to land?

25. What is the best rotation of crops?

26. What is the Norfolk rotation?

27. What is to be remarked on the cleanness of soil?

TREES.

SOURCES OF MANUFACTURE.

1. WHAT can be more grand and beautiful than a forest of trees? As we walk slowly along beneath the over-hanging branches, and behold the stately trunks and the glittering and many-coloured leaves, which here and there reveal to us the bright blue sky; our minds are gradually lifted up from this world to that Beneficent Creator who has provided for us so many means of innocent enjoyment. Even the crooked old trunk, covered with moss and entwined with ivy, gives us pleasure, for it adds to the picturesqueness of the scene.

In the summer season, a walk in the forest is truly delightful; for in the morning, the birds sing on the branches: at noon, there is shelter from the heat in the long vistas of shade; and after sunset the nightingale or blackbird begins to chant its sweet strains, as

"Twilight melts beneath the moon away!"

Apart from these agreeable feelings, trees produce us Wood; a substance, which is of the highest importance to our comfort and welfare. We will divide the subject into Forest Trees and Fruit Trees.

1. What is chiefly to be remarked on forest trees in manufactures, and to what uses are trees applied?

FOREST TREES.

The wood of Forest Trees is divided into *three* classes:—

1. Hard wood.
2. White wood.
3. Resinous wood.

The uses to which the wood of Forest Trees is applied varies much according to circumstances, whether for house or naval architecture, or for implements.

Oak, beech, elm, and fir, are those woods chiefly used for naval purposes. Millwrights use the ash, beech, and walnut; and implements and utensils are made principally of sycamore and poplar. And wood, unfit for any of the above purposes, is exceedingly useful for *fuel*.

FRUIT TREES.

We next come to *Fruit* Trees, which are usually cultivated in gardens and orchards; and the produce of which is so highly prized and so delicious. Fruit, eaten in moderation, is an excellent thing for promoting health, and is so particularly during the warm months of summer.

1. In the ordinary acceptation of the term, *fruit* is understood to mean those *seed-cases** which are eatable, and require not any preparation to fit them for food.

The species of cultivated fruits are by no means numerous, and are included in the natural orders.

1. *Rosaceæ,* 2. *Vitaceæ,* 3. *Urticeæ, and,* 4. *Grossulaceæ.*†—APPLES, PEARS, PLUMS, CHERRIES, APRICOTS, PEACHES, NECTARINES, QUINCES, MEDLARS, RASPBERRIES, STRAWBERRIES, belong to the first; the VINE to the second; the FIG and

* Our young readers have perhaps never before heard this term used, but it is, nevertheless, a very correct one. 4. In the centre of the *apple*, for instance, is the *seed*, and therefore the apple forms a *case* for the seed.

† Our young readers will find it useful to bear this classification in mind; but if they do not learn Latin, they need not repeat it.

MULBERRY to the third; GOOSEBERRIES and CURRANTS to the fourth.

Besides which we have chestnuts, filberts, and walnuts; the melon and the pine-apple.

Of the above there are a vast many varieties, and the proper mode of cultivating and improving them, is the sedulous object of those who make gardening a profession.*

1. Describe the fruit trees generally.

THE FARM YARD.

1. ALL persons who have travelled in foreign countries are aware that the farm-yards of Great Britain are kept in a cleaner state, and in much better order than in other parts of Europe; indeed, our farmers seem to take a pride in keeping their premises dry, comfortable, and neat.

Nothing perhaps gives one more the idea of abundance than a well-stocked farm-yard, for it

* In a work of this kind we do not propose to enter into details, which must, from the want of sufficient space, be imperfect; and we therefore refer those young persons who may take an interest in the subject of gardening, to the numerous publications which are dedicated to its consideration.

contains most of the necessaries of life. Horses, cows, sheep, pigs, fowls, pigeons, hay, straw, corn, oats, barley,* turnips, carrots, vetches,† beet-root,‡ &c.

Near the farm-yard may be seen the pretty house of the farmer; and perhaps two or three happy rosy-cheeked children playing about the door.

We may also suppose that there is a nice garden on the other side of the house, with a smooth grass-plot, some beds of flowers, a green-house full of flowers and shrubs, fruit trees nailed to the walls, apple and pear trees, and also damson, plum, and cherry trees in the centre; and a large space beyond for gooseberries, strawberries, raspberries, black and white currants, and all the useful vegetables, such as lettuces, spinach, asparagus, French-beans, peas, cucumbers, celery, &c.

But we must now give a few more particulars respecting what a farm-yard *ought to be.*

* From *barley malt* is made, by placing the barley in a heated chamber called a *kiln*, after being steeped in water and allowed to germinate. Malt is used in making ale and beer.

† *Vetches* are wild peas.

‡ *Beet-root* is a large red root which is given to cattle. In France they make the sweet juice of it into sugar.

In a FARM YARD, the disposition of the *buildings** is of essential importance.

If large and straggling they are far from convenient, and cost much in repairs; the house of the farmer should be comfortable, and have the windows fronting the south.

There should also be, as we have already said, a garden.

The yard should be to the northward, and there should be a separate paved court, communicating with the dairy, having benches on which to place the utensils in the sun to dry.

On the north side, the yard should be sheltered by the barns. A threshing machine,† and a single floor to thresh seeds upon, are indispensable to the farmer of the present day, who has land under his management to any extent.

There ought also to be a small yard, separate from the other, for the cattle to shelter themselves in, in wet and stormy weather. Cart

* By *buildings* are meant barns, stables, cow-houses, and sheds.

† The *threshing machine* is a very useful invention for obtaining the grain of corn from the ear. Formerly a *flail* (two sticks with a hinge in the middle) was the only instrument used, the threshing machine does a great deal of work in a very short period of time.

sheds; a stack yard, with pillars and frames for the latter; cow-houses, stables, feeding-stalls, a pump, convenient places for hay, straw, and turnips—and proper machines for cutting them—and an underground cistern for the drainings from the cowhouses and stables, this last is extremely useful, and will supply a manure of the very best kind. In addition to cattle,—poultry, rabbits, pigeons, &c., as we before observed, usually form part of a farm yard.

In another portion of this work we have spoken of the various implements, such as *ploughs, harrows*, &c., used in farming.

1. What is to be remarked on the farm yard?

FLOWERS.

1. The celebrated Lord Bacon, one of the wisest men that ever lived, says that the management of a *garden* is "one of the purest of human pleasures," and so it really is.

2. It is also within the reach of most persons, and affords an agreeable occupation throughout the greater part of the year.

3. In order to manage a moderately sized garden, properly, there should not be many varie-

ties of flowers, otherwise the expense and trouble would be very great.

4. The qualities admired in flowers are size, brilliancy, variety of colour, and the length of time they continue to blow.

Plants that are not hardy enough to stand an English winter, may be kept in the house during that season.

5. In order to form a correct idea of what a flower is, it is necessary for our young readers to know that it is that part of a plant which contains within itself the *means of producing more flowers.*

6. For this purpose a flower is provided with a calyx, a corolla, stamens, and a pistil.

7. Some flowers are called *compound* or *composite.*

There are collections of flowers in one head, as for instance that flower which is now to be found in most gardens, called the *dahlia.*

8. Plants which produce flowers may be multiplied by *budding, grafting*; by *layers, pipings, cuttings, suckers;* by the *division of roots and tubes,* and by *seed.*

9. *Cuttings* are chiefly employed, and should be planted two or three inches apart, in pots or boxes, and should then be placed in a tolerably warm 'hot-bed,' out of reach of the sun; they

will thus take root, and give signs of growth in about ten days. Next they should gradually be rendered hardy, and should be placed in separate pots in a flue-pit. On frosty nights they should be warmed and protected by a fire, and by mats. Early in June they may be removed and exposed to the air. Dahlias are planted out at the end of May. Annuals are usually raised from seed sown in April or May.

10. Sweet-peas, mignonette and poppies, should be transplanted from pots. China and German aster, mallows, African and French marigolds should be raised on a hot-bed.

11. A rich, light, and new soil, and a dry, sunny, and well-sheltered situation, should be chosen for flowers.

At the time when there was such a singular rage in Holland for speculations in *tulip* roots, one of those called *Semper Augustus*, of which there were only two in the country, was sold for £402 10s., equal to two beautiful grey horses, and harness, and a new carriage complete!

1. What did Lord Bacon remark on flowers?
2. What are the sources of pleasure?
3. What is to be observed in the variety?
4. What are the best qualities in flowers?
5. What are their properties?
6. What are the principal parts of a flower?

7. What are compound flowers?

8. How are plants multiplied?

9. What is to be remarked on cuttings?

10. What is further to be remarked on the culture of other flowers?

11. What is the best soil?

BOOK III.

THE MINERAL KINGDOM.

INTRODUCTORY REMARKS.

The mineral kingdom forms the solid basis of the globe which we inhabit. From it we derive the means of tilling the ground, and of supplying many essential wants, both commercial and domestic. A vast number of useful medicines, also, for the cure of diseases, belong to this division. In common conversation, the word *mineral* is applied only to Metals; but it comprises a great many other substances which are used in arts and manufactures.

MINERALOGY.

To be committed to memory at an early age.

1. Mineralogy gives a description of every substance in the mineral kingdom.

2. Minerals comprise all dead or inorganic matter.

3. Minerals are either simple or compound.

4. A simple mineral contains the same particles of matter throughout its whole mass, as pure gold.

5. A compound mineral contains two or more substances blended together.

6. Some minerals are supposed to increase in bulk by the unity of small particles of matter adhering to their surfaces; those atoms being of the same primitive form as the mineral itself.

7. The increase of minerals by the adhesion of similar particles, is called increase by *juxta position.*

8. Changes are slowly but constantly taking

place in mineral bodies; they increase in size, arrive at a certain degree of maturity, and gradually decay.

1. What is mineralogy?
2. What are minerals?
3. How are they classed?
4. What is a simple mineral?
5. What is a compound mineral?
6. Are minerals supposed to grow?
7. What is the increase of minerals termed?
8. Do not minerals also decay?

SPECIFIC CHARACTERS OF MINERALS.

1. There are three specific characters always to be observed in minerals, the crystaline forms with cleavage, the degree of hardness, and specific gravity.

2. The forms of crystallized minerals are four, the rhomboidal, pyramidal, the prismatic, and the tessular.

3. Rhomboidal and pyramidal crystals are formed by four-sided isoceles pyramids.

4. The prismatic crystals are in form of a scalene four-sided pyramid.

5. Tessular crystals are in form of the hexahedron.

1. What is the specific character of minerals?
2. What are the forms assumed in crystalization?
3. What are rhomboidal crystals?
4. What are prismatic?
5. What are tessular crystals?

THE SPECIES OF MINERALS.

1. The species of any mineral can be determined by its primitive form or cleavage, its hardness, and specific gravity,

2. The hardness of minerals is taken from analogy, by comparing one with another, and may consist of ten degrees.

3. Felspar is 6 degrees, quartz 7, topaz 8, corundum 9, and diamond 10 degrees, the last being the hardest of all substances.

4. Talc 1 degree, gypsum 2, calcareous spar 3, fluor spar 4, and apatite 5 degrees of hardness.

1. How is the species of a mineral found?
2. How is the hardness ascertained?
3. What substances are used to distinguish the remaining degrees of hardness?
4. What substances are used to denote the first five?

HISTORY OF MINERALOGY.

1. In early ages the mineral kingdom formed no part of critical attention.

2. When metaphysics extended itself to natural philosophy, common matter was placed as the basis of all vegetable, animal, and mineral substances.

3. The arts of dying, pottery, making of glass and forming of metals, were the first efforts of the primitive chemists.

4. To form their ingredients, experiments were necessary to ascertain the nature and properties of stones and earths.

5. In the infancy of mineralogy, we find only three divisions of matter, the vitrifiable, the calcareous, and those on which fire produced no effect, were termed apyrous substances.

6. Cobalt, nickel, manganese, and such as had singular and unknown properties, were termed wild, rapacious, and arsenical compounds.

7. Mankind finding the utility of research, began to multiply experiments, and by the joint exertions of men of science in every country, mineralogy has arrived at its present perfection.

1. Has mineralogy been a science much cultivated in the early ages?

2. What first gave zest to inquiry?

3. What were the results of the earliest experiments?

4. What effect did this limited knowledge produce?

5. How did they class their minerals?

6. How did they class the semi-metals?

7. What was the result of this limited knowledge?

SPECIFIC GRAVITY.

1. Specific gravity is the weight of a body compared with that of another of the same magnitude.

2. If a cubic foot of water be 1000 ounces in weight, and a cubic foot of iron be 7000 ounces, their comparative weights or specific gravities are as 1000 to 7000; or as 100 to 700; or as 10 to 70; or as 1 to 7.

3. Any body immersed in water, becomes buoyant, by being supported to a certain extent by the water, and is consequently lighter than without that support.

4. First weigh the mineral in a pair of gold scales in the air, then suspend it by a hair or silk thread in rain-water, temperature 60 degrees.

5. The mineral will be found lighter weighed in water than in air (say one-third); then the weight in air, divided by the difference of the weight in water, will give the true specific gravity of the mineral.

6. Saline minerals are weighed in essential oil, the gravity of which must be known.

7. The specific gravity of fluid minerals is taken by first weighing a narrow-necked phial:

fill it with water, and weigh it again; then pour out the water, and fill it with the fluid mineral, deducting the weight of the phial.

8. A cubic foot of water weighs 1000 ounces avoirdupois.

9. When the body is heavier than water, say as the weight which a body loses in water, is to its absolute weight, so is one to the specific gravity.

10. When the mineral is lighter than water, add the weight which is necessary to make it sink in water to its weight in air; then say, as this sum is to its weight in air, so is one to the specific gravity.

11. The loss of weight by immersion, is exactly equal to the weight of a quantity of water of the same magnitude as that of the body immersed.

12. Specific gravity is one of the best external tests; but is subject to fallacy, owing to the difference of texture in the same species of mineral.

13. Owing to the variety of texture, water cannot equally penetrate the interstices of minerals of the same component parts.

14. A knowledge of the external appearances and character of minerals, is of the utmost importance, indeed indispensible, to the mineralo-

gist; but chemical analysis of tests alone exhibit strict identity.

1. What is specific gravity?

2. Give an example.

3. Why are minerals lighter when weighed in water than air?

4. How is this performed?

5. What effect will this immersion have on the weight of the mineral?

6. How is the specific gravity of saline minerals taken?

7. How is the specific gravity of fluid minerals taken?

8. What is the specific gravity of water?

9. How is the specific gravity found by calculation?

10. When the body is lighter than water what is the proportion?

11. What is the loss equal to?

12. Is specific gravity of any use in determining the properties of minerals?

13. How does this effect the specific gravity?

14. Are we therefore to conclude that the external properties and forms of minerals are not material in the study of mineralogy?

EXTERNAL CHARACTERS OF MINERALS.

1. The external characters of minerals are colour, transparency or opacity, coherence, texture, shape or cleavage, and specific gravity.

2. The external character of minerals cannot

be relied on, as the most skilful may be deceived, without the agency of chemical tests.

3. The colour of minerals cannot be relied on as a certain criterion of identity; white quartz, white lead-ore and white calcareous ores have exactly the same snow-white colour.

4. Some of the ores of iron, manganese, cobalt, and copper, have the same iron-grey colour, and appear the same in quality, without the aid of analysis.

5. Most coloured minerals change their hues when reduced to powder; cinnabar is dark-red in the lump, but of a beautiful florid red when pounded.

6. The coherence and hardness are general characters; siliceous matter will strike fire with steel; but baked clay will do the same: earths and pulverised stones require tests to develop their character.

7. The texture of a mineral is the arrangement of its component parts, being granular, lamellar, fibrous, scaly, and equable; but those terms are applied to substances widely different.

8. Asbestos, shorl, pumice, pyrites, antimony, malachite, cobalt, and arsenical ores, are fibrous in their texture.

9. The ores of scaly texture are mica, lead, and iron ores, limestone and gypsum.

10. In minerals the lamellar, granular, and equable are the most numerous, and occupy the remaining range of the mineral kingdom.

1. What are the external characters of minerals?
2. Can these determine their nature?
3. Cannot the colour of minerals be relied on to develope their character?
4. In what other ores are the external appearances fallacious?
5. Do not minerals when pulverised change their colours?
6. May not bodies be known by their coherence and hardness?
7. What is meant by the texture of a mineral?
8. What are the fibrous?
9. What are the scaly?
10. Which has the widest range?

SHAPE OR CLEAVAGE OF MINERALS.

1. The form of minerals is attended with so many different causes, that there is an uncertainty as to its identity, without the aid of annalysis.

2. There are thirty-two varieties of calcareous spar, depending on external affinities.

3. Gypsum has fourteen varieties of cleavage, although its component parts are the same.

4. There are nine varieties of fluor spar also depending on accidental causes in formation.

5. Quartz assumes sixteen different forms in cleavage, besides its monstrous forms, which are equally regular as the rest.

6. Feltspar assumes nineteen different forms.

7. Various substances, essentially different, assume the same shape as the foregoing, besides the same specifically.

8. Grey copper ore, cinnabar, blende and native calx of arsenic, assume the tetrahœdral form.

9. Galena lead ore, fluor, common salt, and zeolite, arrange in cubes.

10. Salts are more to be depended on as to form, than any cubic arrangements ; yet the forms are cubes or lozenges, according to the manner of evaporation.

11. Corrosive sublimate and vitriol have been mistaken for common salt, relying on external formation of cubes.

1. Is the form or shape of minerals decisive in developing their class?

2. Does not calcareous spar always present the same external form?

3. Are the forms of gypsum the same?

4. What are the varieties of fluor spar?

5. What are the varieties of quartz

6. What are the varieties in feltspar?

7. Do the same substances assume the same form?

8. What substances, different in composition, assume the tretrahœdral form?

9. What substances assume the cubic form?

10. Do not salts vary in form?

11. Do not many mistakes occur from judging externally?

ROCK CRYSTALS.

1. Rock crystals are transparent substances, generally adhering to rocks, and lining the veins of various metals, shining like diamonds.

2. The term crystal is derived from the Greek word Krustallos, congealed water or ice.

3. Pure rock crystals are composed of silex or flint-earth: they will cut glass like the diamond, but by the diamond they are cut with ease.

4. Pure siliceous crystals, reduced to powder, and mixed with soda, when heat is applied they melt and congeal in form of glass.

5. The silicious rock crystals are hexagonal, or six-sided prisms, terminated by a short six-sided pyramid.

6. Besides the pure and transparent rock crystals, there are others of various colours, viz. red, green, yellow, brown, violet, and blue.

7. The quartz crystals form false gems when set in gold or silver.

8. The coloured quartz crystals derive their tinge from minute metallic particles mixing in their composition.

9. The colourless and brown rock crystals are found in the mining districts of England.

10. The red rock crystals, or false rubies, are found at Oran in Barbary.

11. The yellow quartz crystals, or false topaz, are found in Bohemia.

12. The green rock crystals, or false emeralds and prases, are found at Adeldorf in Sweden.

13. The blue silicious crystals are found at Uto, Bohemia, and Saxony; and the violet is also met with in the two latter countries.

14. The pure quartz crystals become opaque, and split into fragments, with a crackling noise; the tinged lose their colour when exposed to heat.

15. The brown crystals only can be cleared by boiling them in tallow.

1. What are rock crystals?
2. From whence is the word derived?
3. What are the component parts?
4. What is its form when melted?
5. How many sides have they?
6. Are not rock crystals found of various hues?

7. To what purposes are they applied?
8. From whence do they derive their colour?
9. In what countries are they found?
10. From whence are the red?
11. From whence are the yellow?
12. What country produces the green?
13. From whence are the blue and violet?
14. What is the effect of heat on quartz crystals?
15. Can any of these be rendered clear?

CALCAREOUS SPAR.

1. Calcareous spar has the appearance of the quartz crystal, clear and glassy, but much softer, effervescent with acids, and incapable of striking fire with steel.

2. The calcareous rock crystals are formed of crystalized limestone.

3. The crystals of calcareous spar are sometimes rhombic, but their general form is hexagonal with the apex trigonal or three-sided.

4. By burning a fragment of calcareous spar and immersing it in water it will cause a crackling noise, emit smoke, and give to the water a white milky appearance.

5. By placing two pins beneath a crystal of calcareous spar, it has the property of presenting a double image of the object seen through it.

1. What is calcareous spar?
2. Of what is it formed?
3. What is the prismatic form of its crystals?
4. How are they proved to be calcareous?
5. What is to be remarked of their refraction?

FORMATION OF CRYSTALS.

1. Rock crystals are supposed by some to have been formed by the melting of silicious earth in the water of boiling springs, and, when suffered to cool, the crystals formed on the adjacent rocks.

2. Artificial crystals may be formed by melting roach-alum and pouring it into a vessel of unglazed earthenware; as it gradually cools, crystals, equal in brilliancy to the rock crystals, will form on the sides of the vessel.

3. If the alum cool too rapidly, the crystals will be confused and less transparent than by gradual cooling.

4. Crystals of a blue colour may be produced in a similar manner, by using coperas instead of alum.

1. How are crystals supposed to have been originally formed?

2. Can this be performed artificially?

2. Does this exemplify the formation of imperfect crystals?

3. May not artificial crystals of other colour be formed in like manner?

FELTSPAR.

1. Feltspar is a silicious substance generally opaque.

2. This mineral is found white, grey, red, yellow, green, violet, and iridescent.

3. The crystals of feltspar are rhombic, cubic, and irregular.

4. The texture of feltspar is close, but lamellated; it produces fire with steel, but it is softer than quartz.

5. Feltspar is generally in small loose masses not exceeding two inches in length; it is mixed with sand or clay, or embodied in granite.

6. White feltspar contains in 100 parts, 67 of silex, 14 of alumine, 11 of barytes, and 8 of magnesia.

7. The specific gravity of feltspar is from 2.400 to 2.600.

1. What is feltspar?
2. What are its colours?
3. What are its crystals?
4. What is its texture?
5. How is it generally found?
6. What are its component parts?
7. What is its specific gravity?

QUARTZ.

1. Quartz is a silicious substance of a glassy shining lustre, sometimes imbedded in feltspar.

2. Quartz is generally an opaque white substance, with varieties of grey, brown, pink, violet, and blue.

3. It is hard to the knife, of irregular fracture, and, like the diamond, scratches glass; it is massive, and occurs in regular and irregular forms.

4. Compact quartz contains more clay and less united with the silex than the quartz crystals, they crack and become duller when put in the fire, and when rubbed against each other they emit a phosphoric odour.

5. The specific gravity of quartz crystals is from 2.64 to 2.7; the opaque quartz from 2.4 to 2.7.

1. What is quartz?
2. What is its appearance?
3. What is its texture?
4. What are its characteristics?
5. What is its specific gravity?

ELASTIC QUARTZ.

1. Elastic quartz is a species found in the diamond mines of Brazil, remarkable for its elastic flexibility.

2. Elastic quartz resembles the Turkey hone; the integral parts when pounded are flat; it separates in scales pure and pellucid, some long and thin, others broad and short.

3. The scales of elastic quartz are all interwoven in one direction, each junction resembling a hinge, its elasticity being dependent on this mode of aggregation.

4. If a piece of elastic quartz be upright and shaken, its scales vibrate to and fro, but when at rest they closely cohere.

5. When elastic quartz is scraped with a knife, in the dark, it yields a phosphoric appearance.

6. The elastic quartz strikes fire with steel, and cuts glass.

7. By analysis it contains in every 100 parts, 96.5 of alumine 2.5, and oxide of iron 0.5.

8. The specific gravity of elastic quartz is, by Kirwan, 2.624; but, by Klaproth, 3.75.

1. What is elastic quartz?
2. What is its appearance?

3. How are they continued?
4. How is its elasticity observed when aggregated?
5. What is the effect when scraped in the dark?
6. What effect has it on steel?
7. What are its component parts?
8. What is its specific gravity?

1. Mica, in its purest state, is a colourless substance; but by a mixture of iron and other ingredients it is found of various colours.

2. Impure mica is found white, red, yellow, brown and black.

3. The white and yellow mica have a splendid metallic lustre, used, when pounded, to sand writing, and called gold and silver sand.

4. The surface of mica is smooth, but not greasy to the touch as is the case with talk.

5. Mica is always lamellar, the scales or lamellæ flexible, and sometimes elastic.

6. The scales of mica are sometimes parallel to each other, sometimes interwoven, undulated, or in filaments.

7. Impure mica when calcined with four times its weight of fixed alkali, will effervesce with acids; but pure mica in its natural state is neither soluble with acids nor effervescent.

8. Colourless mica yields more readily to borax, with scarcely any effervescence.

9. In 100 parts of colourless mica, there are 38 parts of silex, 28 of alumine, 20 of magnesia, and 14 of highly oxidised iron.

10. The coloured mica contains an addition of 10 or 12 per cent of iron less oxidised than the pure, from whence its colours proceed; but its other ingredients are lessened in proportion.

11. The specific gravity of mica is from 2.535 to 3.000.

1. What is mica?
2. What are the principal colours?
3. Which of those colours are metallic in appearance?
4. How is it distinguishable from talc?
5. What is its texture?
6. How are they ranged?
7. What test is necessary to try mica?
8. To what does it yield more readily?
9. What are the component parts?
10. What is the difference in impure mica?
11. What is its specific gravity?

1. TALC is a semi-transparent substance, of white, yellow, grey, or green colour, soft and soapy to the touch.

2. Talc is found in Aberdeenshire, Banff, and Perthshire in Scotland, and in beds in mica and clay-slate; also in Bahar and other parts of India.

3. In 100 parts of talc there are 62 of silex, 33 magnesia, 1.5 aluinine, 3.5 oxide of iron.

4. The specific gravity of talc is 2.77, and is the the softest of minerals.

5. Talc is either common or indurated.

6. Common talc is disposed in laminar or filamentous form, more brittle than mica, but similar to it in its metalic pearly lustre.

7. The cleavage of talc is single, being separable in thin leaves, serving the purposes of window glass; it is flexible, but not elastic, and so soft as to yield to the nail.

8. The inhabitants of Bahar and China make splendid lanterns, shades, and ornaments of talc, tinged various colours; they use it also in medicine for coughs and consumption.

9. Talc is an ingredient in rouge, with carmine and benzoin, giving softness to the skin; it is also used to give a fleshy colour to gypsum figures by rubbing.

10. Talc, when finely ground, makes a silver sand used to blot writing.

11. Talc is sometimes found crystallized in six-sided tables.

12. Talc does not effervesce with acids, and is partly soluble therein with great difficulty.

13. Talc, by the blowpipe, becomes white, and yields a small globule of enamel.

1. What is talc?
2. Where is it found?
3. What are its component parts?
4. What is its specific gravity?
5. How many sorts are there?
6. What is the common?
7. What is its cleavage?
8. Is it not in great request in Bahar and China?
9. To what other purposes is it applied?
10. What other use is it applied to?
11. Is talc ever found crystalized?
12. What effects have acids on talc?
13. What is the effect of the blowpipe?

INDURATED TALC.

1. INDURATED talc occurs in primitive mountains, imbedded in clay-slate and serpentine.

2. Compact talc is massive, of a greenish-grey colour, translucent on the edges, not flexible, but frangible, and to the touch soft and soapy, as in the common talc.

1. What is indurated talc?
2. What is its colour?

GYPSUM.

1. Gypsum is a calcareous substance of various colours and textures; it is generally white, of various shades.

2. Gypsum has a resplendent pearly lustre on its edge.

3. The cleavage of gypsum is imperfect and curved, being easily broken.

4. The component parts of scaly gypsum are 41.75 of lime, 55. sulphuric acid, and 1.0 muriate of soda.

5. The specific gravity of gypsum is 2.96.

1. What is gypsum?
2. What is its lustre?
3. What is its cleavage?
4. What are its component parts?
5. What is its specific gravity?

SPARRY GYPSUM, OR SELENITE.

1. Sparry gypsum or selenite is found grey, white, and yellow, and sometimes iridescent in colour.

2. Sparry gypsum is found massive, disenamelled, and crystalized in oblique four and six-sided

prisms, forming masses of crystals, one emanating from another.

3. The sparry gypsum prisms are some transparent, yielding a double refraction; others semi-transparent, and in hardness one degree more than talc.

4. The fragments of sparry gypsum are rhomboidal, and cleavage threefold.

5. Sparry gypsum contains 33.9 parts of lime, 43.9 of sulphuric acid, and 21. of water.

6. The crystals of gympsum are daily forming in gypsum hills, old mines, and in blue clay.

7. Gypsum, when burnt, forms plaster of Paris, and is used in forming busts, mouldings, and flooring.

1. What is sparry gypsum?
2. What are its forms?
3. Are they transparent?
4. What are its fracture and cleavage?
5. What are its component parts?
6. Are not crystals daily forming?
7. To what purpose is it applied?

FLUOR.

1. FLUOR is a substance one degree harder than gypsum, divided into compact, foliated, and earthy.

2. Compact fluor is massive, brittle, of a greenish-grey colour, found in veins with fluor spar; its fracture even, and fragments sharp-edged and translucent.

3. Foliated fluor is green, yellow, white, and blue, crystalized in cubes, with white edges; also in rhomboidal dodecahedrons and octahedrons.

4. The cleavage of fluor is fourfold equiangular, and parallel with the planes of the octahedron.

5. The component parts of fluor are 72.1 of lime, and 27.9 of fluoric acid; its specific gravity is 3.15.

6. Fluor, when subjected to the blowpipe, gradually loses its transparency and colour, decrepitates, and melts *per se* into a greyish white glass.

7. Fluor associates with minerals in veins transversing coal formations, primary and secondary rocks.

8. Fluor is cut into ornaments, and used as a flux in melting the ores of metal.

9. The impure or earthy fluor is of a greyish-white, violet, and deep blue colour; it is dull, earthy, and friable, and associates with minerals in veins like the former.

10. Apatite is one degree harder than fluor.

1. What is fluor?
2. What is compact fluor?
3. What is the foliated fluor?
4. What is its cleavage?
5. What are its component parts and specific gravity?
6. What are the effects of the blowpipe on fluor?
7. What does it generally traverse?
8. To what purpose is it applied?
9. What is earthy fluor?
10. What is the next mineral in hardness to fluor?

APATITE.

1. Apatite, or phosphate of lime, is found of various colours, white, red, green, and wine yellow; it is found massive and crystalized, associated with other ores.

2. The crystals of apatite are smooth, low, six-sided prisms, sometimes passing into the six-sided table; they are translucent, but seldom transparent.

3. Apatite is composed of 53.75 parts of lime, and 46.25 phosphoric acid; its specific gravity 3.1.

1. What is apatite?
2. In what forms are its crystals?
3. What are its component parts and specific gravity?

TOPAZ.

1. Topaz is a transparent mineral, one degree harder than quartz; it is of various colours, as yellow, transparent, or colourless, pale from Siberia; saffron coloured as the Oriental russet; reddish, rose-coloured, and green as the Saxon.

2. All the known varieties of topaz have the prismatic form, and stiriated longitudinally; base rhombic.

3. The Siberian and Brazilian topazes, when heated, become positively electrified at one end, and negatively at the other; it is infusible by the blowpipe, but when exposed to high heat, it burns red and blue.

4. Topazes from Saxony, when gently heated, become white; but a strong heat deprives them of transparency and lustre.

5. Topaz belongs to the primary formations, being found in the granite of tin mines, crystalized with quartz and tin.

6. The Brazillian topaz contains 58.38 parts of alumine, 34.01 of silex, and 7.79 of fluoric acid; the Saxon topaz 57.45 parts of alumine, 34.24 of silex, and 7.75 fluoric acid.

7. The specific gravity of the topaz is from 3.4 to 3.6.

8. Topaz is found in large crystals and rolled masses, imbedded in alluvial soil in the granite and gneiss districts of Mar and Cairngorm, Aberdeenshire, and it associates with tin and clay-slate in a vein at St. Ann's, Cornwall.

9. Topazes of a pure yellow colour, and free from flaws, are generally of the most value.

1. What is topaz?
2. What is its form?
3. What is remarkable in the Brazilian and Siberian topaz?
4. What is remarkable in the Saxon topaz?
5. In what class of rocks is it found?
6. What are its component parts?
7. What is its specific gravity?
8. Is topaz not found in Great Britain?
9. What colour is most valuable?

CORUNDUM, OR ADAMANTINE SPAR.

1. Corundum is a grey or white opaque substance, imported from China and India, harder than topaz, but not so hard as diamond.

2. There are three kinds of corundum, distinguished by their form—

Octahedral.
Rhomboidal.
Prismatic.

3. Corundum, on account of its extreme hardness, is used by lapidaries in polishing gems, and the diamonds used by glaziers are generally adamantine spar.

4. Corundum in masses is opaque, but thin pieces, and the edges of prisms are brilliant and transparent.

5. From the extreme hardness of corundum, its analysis is very difficult; but a specimen from China was found to contain, in 100 parts, 86.50 of alumine, 5.25 of silex, and 6.50 of iron; one from Ava yielded 87 alumine, 6.5 silex, and 4.5 iron.

6. Heat the specimen several times red hot, and plunge it into cold water, which will cause it to show fissures in every direction.

7. Next place it in a steel mortar, and reduce it to fragments with a pestle of the same metal; then reduce it to an impalpable powder with an agate pestle and mortar.

8. Expose the powder in a crucible of platinum, with twice its weight of calcined borax; this reduces the corundum to glass, which must be dissolved by boiling it in muriatic acid twelve hours, and the solution will be found to contain the above component parts.

1. What is corundum?
2. Into how many species is it divided?
3. What is its use?
4. Is the whole opaque?
5. What are its component parts?
6. How is the analysis performed?
7. What is the next process?
8. What must be done with the powder thus reduced?

DIAMOND.

1. The diamond is a precious mineral, found in India, Borneo, and Brazil.

2. The diamond was long considered as a stone, but it has by experiments been found to be an inflammable substance, consisting of pure carbon.

3. The diamond is found of various colours, white, grey, red, brown, yellow, green, blue, and black; the last two are extremely rare.

4. The diamond is always internally, and sometimes externally transparent, and when cut, it exhibits a brilliant play of colours.

5. The diamond is found in rolled and crystallized pieces.

6. The general form of diamond crystals is octahedral, with faces curvilinear.

7. Besides the above, diamond crystals assume many varieties.

8. The first form is a three-sided pyramid, with angles truncated; the second is a segment of the octahedron; the third twin crystals; and the fourth dodecahedron.

9. The fifth is the octahedron, with all its edges truncated; the sixth the octahedron, bevelled flat on all its edges; the seventh the rhomboid dodecahedron truncated; and the eighth the octahedron faces convex, each divided in three triangular ones, forming twenty-four faces.

10. The ninth form is the octahedron, with each convex face divided into six planes, forty-eight in all; the tenth rhomboidal dodecahedron, with planes diagonally broken; the eleventh a flat, double, three-sided pyramid; the twelfth very flat, double, three-sided pyramids, with cylindrical convex faces; and the last, small cube crystals, truncated on the edges.

11. In Brazil the diamond is found imbedded in sandstone, resting on clay-slate; in India it is found in clay, and in both countries it is found in the alluvial soil.

12. The diamond is the tenth in hardness, being the hardest of all substances.

13. The specific gravity of the diamond is from 3.4 to 3.6.

14. The value of a diamond is ascertained by its weight in carats.

15. The carat is divided into four parts, called grains, each equal to four troy grains, 120 carats being equal to one ounce, or 480 grains troy.

16. Diamonds without flaw or blemish are generally valued in a rough state at two pounds per carat.

17. The lapidaries charge three pounds fifteen shillings per carat for cutting a diamond.

18. Square the weight of a rough diamond, and multiply by two, will give its value in pounds sterling.

19. The snow-white diamond, pure and transparent, is of the greatest value, and termed a diamond of the first water.

20. The principal diamond mines are those of Ganiand, Golconda; Rolconda near Visapoor; Lalavar and Somelpoor in Bengal. There are also productive mines in Borneo, the Brazils, and Malacca.

21. The first diamond is that belonging to the Great Mogul, weighing 270 carats and 9-16ths; it is of the purest water, in form of an egg cut through the middle,

22. The diamond of the Great Mogul is estimated at £512,890 pounds sterling.

23. The largest diamond ever found was that sent from Brazil to the Queen of Portugal in

1746, weighing 1680 carats, or more than eleven ounces.

24. The Portuguese diamond is still uncut, and is estimated at the vast value of £5,644,800 sterling. This is considered by some to be only a white topaz, and not a diamond.

25. The diamond of the Rajah of Mattan, in the island of Borneo, is egg-shaped, with an indentation near the smaller end, and weighs 364 carats, or more than three ounces.

26. The superstition of the Malays respecting this gem, preclude any value as to purchase; they attach to it the power of curing all disorders by means of the water in which it is dipped, and also that the fortune of the family is maintained by its possession.

27. The Pitt diamond was purchased by Mr. Thomas Pitt, governor of Fort George, for £20,400, and sold to the Duke of Orleans, Regent during the minority of Lewis XV.

28. The Pitt diamond was placed among the crown-jewels of France, and was set in the handle of the Sword of State in the reign of Buonaparte.

29. The Pitt diamond is one the most brilliant gems of the first water, weighing, rough, 400 carats, and polished, 136¾ carats, for which Mr. Pitt received from the Duke £135,000.

30. The cutting and polishing the Pitt diamond cost £4500, the diamond powder used cost £1400, and the small pieces cut from it were worth £8000.

31. The diamond in the imperial crown of Russia was originally one of the eyes of the famous statue in the temple of Bramah at Sheringham in the Carnatic.

32. A French soldier deserted from the army in India, and to obtain this diamond, became one of the priests of the idol, in order to steal its eye, which he effected, and sold at Madras to the captain of a ship, for £2500.

33. This diamond was next sold to a Jew for £18,000, and then to a Greek merchant, who sold it to Prince Orloff in 1766, for the Empress Catherine of Russia, paying £90,000, and an annuity of £4000 to the vendor during his lifetime, being much less than the real value of the gem.

34. The Russian imperial diamond is of the size of a pigeon's egg, weighing, rough, 779 carats, and polished, 194 carats.

35. In choosing the rough diamond, those which are most perfect are crystaline, resembling a drop of clear spring water, in the centre of which is a strong light, with a beautiful play of colours; and if taken from the sun into a dark room, they

will remain luminous, and if rubbed well, will at-attract and repel light substances.

36. The purest diamonds are crystalized in octahedral prisms, terminating in a point.

37. Diamonds are supposed to have been known prior to the Christian Era; but the art of cutting and polishing them was first practised by Bonis de Berguen, a native of Bruges, in 1450.

38. Diamonds are yellowish, bluish, or steel-coloured, green and black.

39. The diamond burns with a flame; it is consumed and dissipated in a crucible at a lower degree of heat than will melt silver.

1. What is the diamond?
2. How is it ranked?
3. What is the colour of the diamond?
4. What is its appearance?
5. What are its forms?
6. What are the forms of its crystals?
7. What are the other forms?
8. What are the first four varieties?
9. What are the next four varieties?
10. What are the remaining varieties of diamond crystals?
11. With what does it associate?
12. What is the degree of hardness?
13. What is the specific gravity of the diamond?
14. How is the value of a diamond ascertained?

15. What is this weight?

16. What is the value per carat in a pure rough diamond?

17. What is the expence of polishing?

18. How do you find the value of a rough diamond?

19. What is meant by the water of a diamond?

20. Where are the principal diamond mines?

21. Which is the principal diamond?

22. What is its value?

23. Is this the largest diamond?

24. What is its value?

25. What is the weight of that possessed by the Rajah of Mattan?

26. What is its value?

27. What is the Pitt diamond?

28. Where was it subsequently placed?

29. What is its weight and value?

30. What was the charge of polishing?

31. What is the history of the Russian diamond?

32. How was it abstracted?

33. What was its future history?

34. What are its size and weight?

35. What is the best colour of diamonds?

36. What is the form of the crystals?

37. Were diamonds known to the ancients?

38. What are the colours?

39. Is the diamond combustible?

GEMS.

1. The diamond, ruby, emerald, and sapphire, are the most valuable gems.

2. In stones, of each a grain in weight, the diamond is worth £8, the ruby £4, the emerald and sapphire £3 each per carat.

3. The amethyst, topaz, and aqua-marine, are equal to each other in value; the garnet is the cheapest of all precious stones.

1. What are the gems of most value?
2. What is their comparative value?
3. What are the next in value?

METALS.

GOLD.

1. This metal occurs in greater or less quantities in every part of the globe; and has from time immemorial been employed as a medium of exchange. It is found in a native state, and combined with silver; and is sometimes in union with sulphur and arsenic. The mine of Zawero-Alexandrowsh, in Siberia, is one of the richest in the world, and in one instance furnished a lump of gold weighing twenty-three pounds; gold also occurs in crystals.

2. The means by which gold is separated from its compounds, consists in using mercury as an amalgam, and having recourse afterwards to the process called *distillation*. 3. Gold is of a very very fine yellow colour; almost as soft as lead; of the specific gravity of 19.3; and is so malleable, that a *single grain* may be extended over a surface of fifty-six square inches. 4. Leaf gold is only *one two hundred thousandth* of an inch in thickness!

5. The ductility of gold is also very great, for one grain may be drawn out into 500 feet of wire. In tenacity, however, it is inferior to platinum, iron, silver, and copper.

6. Gold suffers no change by exposure to air or by fusion. When in this latter state, it assumes a fine green colour. 7. Gold combines with many metals, and copper is used as an alloy at the mint in the proportion of 1 in 12.

1. Where is gold found, and in what countries is it most plentiful?
2. How is gold separated from its compounds?
3. What is its colour and specific gravity?
4. What is the thickness of leaf gold?
5. What is its ductility?
6. What is its appearance in fusion?
7. What is the proportion of alloy in coins?

LEAD.

1. When first melted, this metal is of a brilliant whiteness, but it soon assumes, by exposure to the air, a dull, heavy appearance. 2. It is malleable, but does not become hard under the hammer; is easily fusible, and has very little sonorousness. 2. There are many lead mines in this country, chiefly in Flintshire, Shropshire, Denbighshire, Somersetshire, Cumberland, Westmore-

land and Derbyshire. Also in parts of Scotland and Ireland.

3. One sort of ore is called *Galena*, and is combined with various earths; lead is first washed, and then melted in furnaces, either upright or reverberatory, so as to expel the sulphur, and separate the earthy matter in the form of *Scoria*. 4. That which runs off through an aperture at the bottom is caught in an iron pan, and poured out into moulds, and is then called *Pig-lead*. It is exported in this form; or it is rolled into sheets and drawn into pipes for domestic and other purposes. 5. The quantity of lead produced in this country is about 2000 tons annually.

6. Rollers are used in making this metal into sheets; but in drawing it into pipes, a rod of iron is inserted in a round mass of lead, and this last is drawn through iron apertures of a gradually diminishing size. By this means the pipes have no seam, and have a polish within and without.

1. Describe lead.
2. Where are the principal lead mines in this country?
3. How is the ore prepared for smelting?
4. How is the pure lead separated?
5. What is the average quantity obtained in this country per annum?
6. How is lead made into pipes?

SILVER.

1. This metal is white in colour; brilliant, sonorous, and ductile, and is ten times heavier than water.

2. It is sometimes found nearly in a state of purity; is occasionally crystalized; and also takes the form of reticulated wire.

3. The Ores of silver are numerous, and are composed of lead, arsenic, sulphur, and other substances in combination.

4. A considerable quantity of silver is procured from the mines of Potosi in South America, the annual value amounting to about £2,500,000. Silver is found in many parts of Northern Europe, and in the lead-mines of England, much has been occasionally discovered. The Beralston mines in Derbyshire have sometimes yielded £50,000 worth of silver in a year.

5. In order to its extraction, this mineral is pounded, roasted, washed, and then mixed with mercury in vessels of water, which, being agitated, the two metals combine. By means of heat the mercury is driven off, and the pure silver remains; it is then melted, and cast into bars or ingots. 6. This is the process in Mexico and

Peru; in some other countries lead is used in lieu of mercury.

7. In point of value, silver ranks next to gold. It is coined into specie, and is fabricated into various utensils for the table, commonly called *silver plate.*

8. Silver is the least changeable of metals after platinum and gold. It is nearly as ductile as the latter, and may be beaten into very fine thin leaves, and drawn into wire. 9. What is called *gold-lace* is made of silver wire gilt, and twisted round silk. Copper is frequently coated with silver, and forms a very useful article under the name of *plated-ware.* In this case the copper is placed between silver ingots and rolled out. An ounce of silver may thus be flattened into a surface of three feet; the thickness of the copper not being more than the three thousandth part of an inch.

1. Describe silver.
2. How is silver generally found?
3. Of what are the ores composed?
4. Where are the most lucrative silver mines?
5. How is this metal divested of impure minerals?
6. Are there not other substances used instead of mercury?
7. How does it rank in value, and to what purposes is it applied?
8. What is further to be remarked on this metal?
9. How is gold lace formed?

MERCURY.

1. When in its native state, mercury is called *quicksilver;* and is found in small globules of a shining appearance scattered through stones, clay, and ores. It is fourteen times heavier than water. 2. The principal ore is called *cinnabar,* which is of a red colour, and consists of mercury combined with sulphur. It is sometimes found in a massive state; sometimes in grains; sometimes crystalized; and chiefly, in the coal rock.

3. The mines most productive of cinnabar, are in the Palatinate of Germany; at Idria in Cariola; and at Almaden in Spain. 4. In order to extract mercury from cinnabar, the latter is mixed with pounded chalk, and "distilled" in a retort.

5. When native mercury is combined with other substances, the whole is ground into coarse powder; water is poured on it; the mass is stirred, and the sediment is put into large iron retorts, by which means the pure metal is obtained.

6. Mercury may be divided into an infinity of particles, and its fluidity is not affected by frost; but it may nevertheless be artificially frozen.

7. Mercury is used for thermometers and ba-

rometers; and as an amalgam for colouring and gilding. It is also employed in making looking-glasses, and as an article of medicine.

1. How is mercury found?

2. What is its principal ore, and in what forms is it found?

3. Where are the mines of mercury?

4. How is mercury obtained from cinnabar?

5. What is the process when combined with other substances?

6. How is mercury affected by frost?

7. Whas are the principal uses of mercury?

IRON.

1. Of all metals this is the most abundant, and the most useful; and is found in soils, rocks, minerals, and even in animal and vegetable bodies.

2. It is rarely found in a state purely metallic, although in Siberia a kind of native iron combined with platinum is sometimes discovered. 3. Iron is susceptible of a high polish; is combustible in the state of *filings;* is hard, and admits of this quality being much increased. It may also be rendered permanently magnetic.

4. The ore, after being roasted, is smelted in upright furnaces—a considerable quantity of coke and limestone being used in this process. The

heat of the fire is kept up by *blowing-cylinders*, which act as bellows; and the result is what is called pig-iron, which is used for *castings;* or by undergoing other processes in the reverberating furnace, is ultimately passed through rollers, formed into sheets, bars, or rods, and is known as *wrought-iron*.

5. *Wrought-iron* is iron rendered soft and pliable, and is made into sheets and bars. Steel is made of this kind of iron. *Cast-iron* is iron just as it is melted out of the ore: it is melted over again and *cast* into moulds, for pipes, machinery, cannon, rails, &c.

6. The value of iron now produced in this country amounts to £5,400,000.

7. *Steel* is iron tempered into hardness, and is chiefly manufactured at Sheffield.

1. Where is iron generally found?
2. Is there native iron free from other minerals?
3. What is further to be remarked?
4. How is iron prepared, to be divested of other substances?
5. What is wrought-iron?
6. What is the value per annum manufactured in this country?
7. What is steel?

PLATINUM.

1. Pure platinum is the most ponderous of metals, and is about twenty times heavier than water. It is extremely difficult to melt, is white, but not so bright as silver. It is found in South America, in angular scales; in the sands of rivers; and in some of the Siberian mines.

2. To melt it, platinum requires the heat of a mirror, of galvanic electricity, or of oxygen gas. It is very ductile, and is manufactured into wire, sheets, &c., and is used for reflecting telescopes—for watch-work—for enamel-painting—and for painting on china; in the latter cases, it is fused with arsenic.

3. Platinum when fused into a sponge-like form, although perfectly cold, becomes *red-hot* under a jet of hydrogen gas, and fires the gas. The causes of this very curious phenomenon have not hitherto been explained.

1. Describe platinum, and state the countries where it is found.

2. Is it difficult of fusion, and what are its uses?

3. What is the effect of hydrogen gas on platinum?

COPPER.

1. The metal known by this name has a red colour, and will receive a good polish. When it is rubbed, it emits an unpleasant smell and is disagreeable to the taste; and all the preparations from it are of a poisonous nature.

2. Copper is malleable both when hot and when cold. It may be reduced to very thin leaves; and its ductility is also considerable, and admits of its being drawn out into fine wire. In point of tenacity it ranks next to iron and platinum; it melts at the fusing point between gold and silver; it oxidizes and becomes a green carbonate in moist air, and is extremely sonorous.

3. Copper is found in a great number of places, and in large quantities. Its ores are very numerous, and are combinations of the metal with sulphur, iron, and oxygen—the latter forming the *ruby* copper ore, which occurs much less frequently than the *black* oxide.

4. The ores are *smelted* in large reverberating furnaces; and the metal is subsequently *calcined*, *roasted*, and *refined* in other furnaces.

5. Copper is usually first cast into moulds, and forms "*pigs*," and is so exported, or is rolled into

sheets for ship-sheathing, and various other purposes.

It is also rolled into rods, and drawn into wire. By combining it with zinc, the product is the well known metal called *brass*.

The mines of this country are principally in Devonshire, Cornwall, and Anglesea, and they produce copper annually to the value of about £1,300,000.

1. Describe copper.
2. Describe its malleability, and how does it rank amongst metals.
3. In what form is it found?
4. By what means is it smelted and refined?
5. To what purposes is it applied?

TIN.

Oxide of Tin.

1. The colour of this metal is white, something like silver; it is, however, much lighter than that metal; is soft, ductile, and non-elastic. It is found in the state of Oxide, is combined with sulphur and copper, and is seven times as heavy as water.

2. The principal mines of this country are in

Cornwall and Devonshire. It is also found in Germany, Malacca, Barca, Chili, and Mexico.

3. Iron *tinned* becomes "*tin-plate.*" Immersion in sulphuric acid, and subsequently in melted tin, produces this article, of which immense quantities are fabricated. The iron is completely penetrated by the solution.

4. Tin is used as an amalgam with mercury for looking-glasses, and in making bronze and pewter.

Oxide of Tin is much used in dying, and gives great brightness to colours used for producing scarlets and other reds, and for precipitating the colouring matter of certain dyes.

5. Tin-foil is an alloy of two parts of tin and one of lead, and may be beaten into less than one thousandth of an inch in thickness.

1. How is tin found?
2. Where is tin principally found?
3. How is tin-plate formed?
4. What are the uses to which tin is applied?
5. What is tin-foil?

ANTIMONY.

Sulphuret of Antimony.

1. This metallic substance is compact, brilliant, and in colour of a bluish-white. It is not ductile, and is seven times heavier than water.

In texture it is laminated, is hard as silver, and is so brittle, that it may easily be reduced to powder.

2. The principal supply, from Hungary and Norway, is called SULPHURET OF ANTIMONY. 3. By fusion in crucibles, and by re-melting, it is brought into a fit state for sale.

There is only one mine in Great Britain, and that is in Dumfrieshire.

3. It is much employed in *medicine;* and is also used as an alloy with lead for printers' types.

1. Describe antimony.
2. Where are the ores of antimony found?
3. To what purposes is it applied?

ZINC.

Sulphate of Zinc.

1. The colour of this metal is a bluish white, formed in thin plates which adhere together.

It is about seven times heavier than water; is harder than silver; and possesses little malleability or ductility.

2. It is never found pure, but in the state of *calamine* and of *blende*. The former is an oxide of zinc combined with carbonic acid; and the latter is a combination of *sulphuric acid* with zinc.

3. The ores are abundant, particularly in North Wales, and in Derbyshire.

4. Zinc is extracted from its ores by *distillation*; and the globules are a second time melted in order to run the metal into a mass.

5. By annealing it, zinc becomes capable of being rolled out into sheets, and may also be drawn into wire. It is now extensively employed as a substitute for lead, and many domestic purposes.

6. It is used in making brass and bronze; and is now somewhat extensively employed in lieu of stone for engraving. This process is called *zincography*. Zinc plates are used in galvanic preparations.

1. Describe zinc.
2. In what state is it found?
3. Where are the ores most abundant?
4. How is it separated from its ores?
5. What is its ductility?
6. To what other purposes is it applied?

GEOLOGY.

1. The structure of the globe we inhabit, and the changes it has undergone in former ages, are the most interesting subjects of inquiry that can engross the attention of mankind in an advanced state of physical science.

2. Geology comprises the structure and composition of the Earth, the changes it has undergone and which are now taking place, by external or internal agency.

3. The geologist must minutely trace in existing phenomena the causes by which former changes were effected; distinguishing partial revolutions from those which have affected the whole globe.

4. The state of elements in the central parts of the earth, and their existing arrangement, cannot be ascertained by investigation, therefore this part of geology must be purely speculative.

5. The matter erupted from volcanoes is brought from vast depths, and contains similar elements to those which form the surface: but as the exact depth from whence these substances are ejected cannot be ascertained, man, with all

his means of investigation, finds himself a very limited being.

6. The inner part of the earth possesses greater density than the earth and stones of which its surface is composed.

7. Professor Playfair has computed the mean density of the earth to be five times greater than water: that is, if the globe could be weighed in a scale, it would require five globes of water of equal bulk to the earth to balance it.

8. According to the observations of M. de la Place, the internal strata of the earth increase in density as they approach the centre.

9. The structure of the external part of the globe is laid open by the intersections of mountains by torrents and rivers, also by the action of the sea upon the coasts, by fractures of the strata, and by the irregular rising of layers to the surface in an inclined position.

10. The average thickness of the crust of the globe exposed by intersections is estimated at five miles.

11. The phenomena presented by the various layers of rocks, as they reach the surface, have given rise to various conclusions as to the original formation of the globe, and geologists are now divided into two distinct sects, Neptunists and Plutonists.

12. The Neptunists allow no other agency than water in the primary formation of rocks; affirming that rocks are only the effects of chemical precipitations, or mechanical deposits from an aqueous fluid.

13. The Neptunian theory was systematically supported by Professor M. Werner of Freyberg; from whom it is called the Wernerian system of geology.

14. The Plutonian system of geology is founded on the supposition that subterranean heat is one of the greatest agents in the formation and consolidation of rocks.

15. The Plutonian theory has been ably supported by the late Dr. James Hutton of Edinburgh, who introduced certain modifications, and gave it a more comprehensive range; from which it is called the Huttonian system of geology.

16. The Neptunists and Plutonists agree that the present continents have been covered by the ocean, and that the materials of the upper rocks and strata are deposits from an aqueous fluid.

17. Having proceeded thus far in opinion, Hutton and Werner diverge, and differ in their opinions as to the causes by which the continents were laid dry, the mountains elevated, and the materials converted into stone.

1. Is the study of geology of much importance?
2. What does this science comprise?
3. What is the next object of the geologist?
4. Are not the internal elements hid from human view?
5. Do not the materials ejected by volcanic eruptions tend to throw some presumptive proofs on this subject?
6. What is the supposed density of the earth?
7. What is the mean density?
8. Does this density increase or decrease towards the centre?
9. What are the best external modes of investigation?
10. What thickness may be thus examined?
11. What has this tended to illustrate?
12. What do the Neptunists affirm?
13. By whom was this theory founded?
14. What is the system of the Plutonists or Volcanists?
15. Who was the principal supporter of this theory?
16. In what points do Werner and Hutton agree?
17. Upon what points do they differ?

NEPTUNIAN OR WERNERIAN SYSTEM.

1. Werner divides his system into two parts: First, the Classification of Rocks; and, Secondly, the Speculative Part, comprising the mode of their formation, and the original condition of the globe.

1. Into how many parts is it divided?

CLASSIFICATION OF ROCKS.

1. Rocks are divided into five classes — primitive, transition, floetz, alluvial, and volcanic.

1. How many kinds of rocks are there?

PRIMITIVE ROCKS.

1. Primary rocks are crystalline, containing no organic remains.

2. The primary rocks are always found lower than those which contain organic remains, and are considered to have been formed before them, —from which they are termed primitive.

3. The crystals in primitive rocks are deposited in a confused manner, as in granite; sometimes the crystals are imbedded in other substances, as in porphyry.

4. There are fourteen primary rocks, namely, granite, gneiss, mica-slate, clay-slate, primitive limestone, primitive trap, serpentine, porphyry, silenite, topaz-rock, quartz-rock, primitive flinty slate, primitive gypsum, and white stone.

1. What is to be observed of primary rocks?
2. What is their situation?

3. How is the crystalline structure formed?
4. How many primitive rocks are there?

TRANSITION ROCKS.

1. The transition rocks contain an abundance of organic remains, both animal and vegetable.

2. The first-formed layers of transition rocks contain the remains of many animals now extinct.

3. The transition rocks have no crystallization, but seem rather to have been formed by the falling down or settlement of the substances of which they are formed.

4. The materials of the secondary rocks seem to have been held in solution over the primary until the substances became consolidated.

5. There are five kinds of transition rocks, namely, transition limestone, transition trap, greywacke, transition flinty slate, and transition gypsum.

1. What is to be remarked of transition rocks?
2. What do the more ancient contain?
3. Do they appear crystallized?
4. How could this be effected?
5. How many transition rocks are there?

FLOETZ ROCKS.

1. The floetz rocks, or flat rocks, rank next above the transition rocks, and are more recent in their formation.

2. The floetz rocks are nearly horizontal, and contain the remains of marine animals, more nearly resembling those in our oceans than those found in transition rocks.

3. There are twelve species of floetz rocks, namely, old red sandstone, floetz limestone, floetz gypsum, second or variegated sandstone, second floetz gypsum, shell limestone, third sandstone, rock salt, chalk, floetz trap, coal, and newest floetz trap.

1. What is to be remarked on the floetz rocks?
2. What is their position?
3. How many kinds of floetz rocks are there?

ALLUVIAL DEPOSITS.

1. Alluvial deposits are formed over the floetz rocks, and sometimes rest on primary; they are composed entirely of the debris of rocks and other substances.

2. The remains of fish, and land and amphibious animals are found in alluvial deposits, more perfect in their organic structure than in any of the preceding rocks.

3. The alluvial layers are five, namely, peat, sand and gravel, loam, bog iron ore, calcareous tufa, &c.

1. What are alluvial deposits?
2. What remains do they contain?
3. What are the different layers?

VOLCANIC ROCKS.

1. Volcanic rocks are formed from the ruins of other rocks, by the agency of subterranean fire: many even bear the marks of fusion, others show little of their ever having been submitted to heat.

2. Volcanic rocks are divided into pseudo volcanic and true volcanic.

1. What are volcanic rocks?
2. How are they classed?

PSEUDO VOLCANIC ROCKS.

1. The pseudo volcanic rocks are five, namely, burnt clay, porcelain jasper, earth slag, columnar clay, ironstone, and polishing slate.

1. What are the pseudo volcanic rocks?

TRUE VOLCANIC ROCKS.

1. The true volcanic rocks are three,— stones and ashes, lava, and the matter from muddy eruptions.

1. What are the true volcanic rocks ?

APPEARANCES OF PRIMARY AND SECONDARY MOUNTAINS.

1. Mountains composed of primary rocks, present lofty, rugged, and uneven summits, with steep acclivities on the sides, as though they had suffered by convulsion.

2. Mountains composed of secondary beds of strata are less lofty and rugged; their summits are flattish or rounded, and their sides more easily accessible.

3. The acclivities of secondary mountains are rendered more accessible, when the hollows are filled, or partly filled, with alluvial deposits.

1. What is the appearance of primary mountains ?
2. What is the appearance of the secondary ?
3. What alteration is made by alluvial deposits ?

MINERAL DEPOSITS.

1. Both the primary and secondary mountains are traversed in various directions by fissures filled with stony or metalliferous substances.

2. The metalliferous fissures are called veins, from which most of the minerals in the cabinet of the mineralogist are extracted.

3. Few veins in England extend more than 1200 feet below the surface of the mountains in which they are situated.

4 The veins in Cornwall run nearly east and west, and form a considerable angle with regular strata; some of them have been worked three and four miles.

5. In Cornwall the mines are kept dry by means of powerful steam-engines, discharging incessantly, night and day, 1000 gallons every minute.



1. Where are the principal mineral deposits?
2. What are those termed?
3. To what depth have veins been explored?
4. In what direction do they run?
5. How are they cleared from the waters of subterranean springs?

SURFACE OF THE EARTH.

1. The first layer is generally a rich black mould, formed mostly of animal and vegetable remains.

2. Providence devoted this to yield vegetation for the support of the whole animal creation.

3. Beneath the upper layer is another of clay, which furnishes mankind with materials to make pottery, bricks, tiles, and many articles for the necessities and conveniences of life.

4. Next within the reach of man are placed layers of sandstone and limestone, as materials for building; and lower, the beds of coal, so necessary for the comfort and existence of the human race.

5. We are acquainted with the internal structure of the earth only to a very limited extent, not reaching more than one fourth of the height of the highest mountains above the general level.

1. What is to be remarked of the upper strata of the earth's surface?

2. What is this designed for?

3. What is the next thing for the use of man?

4. What are the next things for his use?

5. To what extent does human penetration reach, as to our knowledge of the internal parts of the earth?

PART SECOND.

1. Werner considers that the primæval ocean held in solution the materials of rocks and strata in a calm and undisturbed state.

2. The elements of the primary rocks held in solution, were argillaceous, silicious, and magnesian earths.

3. The elementary materials of the globe began to cohere, crystallize, and fall down in this quiet state of the waters, forming the granitic nucleus of the globe.

4. The process of crystallization continued, and elevated peaks and ridges shot up into the surrounding waters, and occasioned the original inequalities of the earth's surface causing the water to retire.

5. Succeeding deposits covered the sides and summits of the lower crystalline masses, forming the primary rocks, namely, granite, gneiss, and mica-slate, with their metals formed contemporaneously, tin, tungsten, and molybdena.

6. As crystallization proceeded, the water became gradually agitated, and the summits of the loftiest mountains first emerged from the abyss.

7. The agitation of the waters prevented the perfection of crystallization, and as the water re-

tired and diminished in depth, its motions were increased, and the agitation reached down to the surface of the solid mass.

8. The increased agitation tended to destroy the upper crystalline shoots, which fell down, and formed mechanical deposits.

9. The lower rocks must be regarded as purely chemical; but the deposits, after the appearance of the dry land, laid the foundation of new formations, which are principally mechanical, and from their variety in appearance form a beautiful connected series.

10. The state of the water of the globe alters gradually as we approach the newer periods, by the abundance of limestone and the occurrence of coal and salt; the disappearance of the old and the appearance of the new metals.

1. What is supposed to be the most conclusive mode of the earth's original formation?
2. Of what did those elements consist?
3. What was the first process of consolidation?
4. What was the supposed result?
5. What was formed by this process?
6. What was the state of the water during the increase of crystallization?
7. What did the agitation of the water produce?
8. What effect had this in forming the globe?
9. What was the next result?
10. What rocks are predominant in the newer formations?

JAMESON'S OPINIONS.

1. Mr. Jameson supposes the limestone formation, as it occurs in the primary, secondary, and floetz rocks, to illustrate a principal formation suite.

2. The first member of the limestone suite is the white granular limestone."

3. The white granular limestone occurs in gneiss, mica-slate, and clay-slate.

4. The distinct concretions of granular limestone are large; but in the newest clay-slate they are more minute, and approach to a compact substance.

5. The second member of the limestone series is contained in the transition rocks; it is variegated, having less translucence than the first series, but more than the succeeding members.

6. The second or variegated limestone shows the first trace of petrifactions.

7. The stratified or grey floetz limestone is the third member of the series; it is full of petrifactions, and scarcely translucent.

8. The grey floetz limestone has some resemblance to the transition limestone, but very little to the primary.

9. Chalk is the newest calcareous formation: it connects the foregoing members, which have been deposited from the ocean, with calc-tuff, the lowest link of these formations.

10. The members of the calcareous suite form a complete series; from the earliest to the latest periods a gradual increase of the earthy, and disappearance of the crystalline is at once visible and convincing.

11. The difference in the component parts of the different members of the limestone suite proves distinctly the great but gradual alterations of the state of the universe, and the state of the solvent from which they were precipitated.

1. What has Jameson advanced on the formation suites?
2. What is the first member of this suite?
3. Where does this occur?
4. Are these concretions large?
5. What is the second member of this formation suite?
6. What is remarkable in this series?
7. What is the third member of the suite?
8. In what does this resemble the two former?
9. What is the newest calcareous formation?
10. What is generally to be observed in this suite?
11. What does this prove?

GRADUAL INCREASE OF ORGANIC ANIMALS AND LAND PLANTS.

1. The waters having covered the whole surface of the globe during the formation of the primary and oldest transition rocks, no plants or land animals could exist on the globe.

2. The first traces of land plants and animals are in the newest transition rocks.

3. The existence of land plants and animals found in the newest transition rocks, must have been formed when a portion of the globe was made dry, and capable of supporting terrestrial vegetation.

4. From the newest transition rocks to the newest alluvial, both the quantity and variety of plants and animals increase in strata as they reach the surface.

5. This proves the increase of dry land, and the decrease of the ocean on the earth's surface, the land being better fitted to support animal and vegetable life.

6. Coal being a vegetable remain, we find this substance increase in extent in the newest formations, and, from its being limited, it is termed a local independent formation.

7. In the newest formations, the animal remains are more perfect, and assimilate more to those inhabiting the present seas and dry land, than in the older formations.

1. Did the primitive and secondary contain any remains of plants or organic matter?

2. Where are they first traceable?

3. How are they supposed to have been formed?

4. What is next observable as to the increase of animal remains and plants?

5. What does this prove?

6. What further proofs have we of the rank and existence of vegetable productions?

7. Do these plants and animals assimilate with those now in existence?

TRAP PORPHYRY AND SIENITE.

1. Trap porphyry and sienite occur, covering other rocks and strata, without any conformity with the position of the lower beds.

2. The above rocks bear a similarity to that of many volcanic rocks, both in their properties and position.

3. Trap porphyry and sienite are called by Werner overlaying rocks.

4. Porphyry and sienite are of a much earlier origin than basalt.

1. What is to be particularly remarked on these rocks?
2. What do they resemble?
3. What are they called in this system?
4. Whether is basalt, or the above rocks, of the earlier formation?

EXPLANATION BY WERNER.

1. The Wernerian geologists affirm that after the water, which originally covered the whole globe, had retired to its present level, rose again at two different periods, and covered some of the highest mountains.

2. In the first overflowing of the ocean, porphyry and sienite were deposited; in the second rise, rocks of basalt, or the newest floetz trap, were deposited.

3. In the latter overflow, the water rose 11,000 feet above the level of the sea.

4. The water, at the second overflow, was in a very turbid and agitated state.

5. The first depositions were composed of gravel, sand, and mud.

6. The water became gradually less turbid, and settled down to a calm, and the depositions became chemical precipitates, forming the basaltic rocks.

7. When the ocean had completed its deposi-

tions from agitation, it retired back, the tops of mountains began to appear, and the ocean retired to its former bed with considerable rapidity.

1. What are the opinions of the Wernerians on those formations?

2. What were deposited at those periods?

3. To what height did the water rise?

4. What was the effect on the water?

5. What was the nature of the deposits?

6. Did the water continue in a turbid state?

7. When the labours of the ocean thus ceased, what was the result?

OBJECTIONS TO WERNER'S SYSTEM.

1. There are many objections to the system of Werner; the greatest is, that most substances of rocks are insoluble in water, or require so large a quantity of it to effect solution, that a hollow sphere equal to the globe itself could not contain a sufficient quantity of aqueous menstruum to effect solution.

2. The organic remains found in different strata, clearly prove that the water of the primitive ocean must have been similar in its nature to our present seas and lakes.

3. The great diminution of water is certain;

but the causes of that diminution have never been satisfactorily explained.

4. The third objection to the Wernerian theory of geology is, that the succession of rocks in different countries very seldom agrees with that of universal formations; nor can a regular gradation of their crystalline structure be traced.

5. If the waters which deposited the primary rocks, had remained in a calm, quiescent state, the gradual succession of deposits would be similar in the most remote districts: whilst in many instances it is at variance with the theory of Werner.

6. If the basaltic rocks had been formed by a general inundation after the formation of the secondary strata, every part of the dry land must have been encrusted with basalt, and the valleys filled with it, and this substance would have been the prevailing rock of every district.

7. Basaltic rocks occur only in detached masses of limited extent; nor does a sufficient quantity exist to warrant the opinion that it ever covered the whole globe.

8. The newly-formed basaltic layer may have been carried away by the returning ocean, and deposited at lower levels than we have the means of exploring, forming submarine layers.

9. During the retiring of the waters at the second inundation, it was in a more quiescent state,

whilst the tops of mountains were laid bare, thus leaving the basaltic formations stationary, whilst, as it increased in rapidity of motion, the water may have carried the basaltic layers to the lowest levels, never to be discovered till the great Southern Ocean becomes dry land.

10. This would in a great measure confirm the general theory of Werner, as to basalt, but not in every particular.

11. Most of the basaltic rocks to which Werner has attributed an aqueous origin, are now generally admitted to be volcanic, from their affinity in composition with lava.

1. What are the principal objections to this system?

2. Might not the original water of the ocean have possessed greater solvent qualities than it at present does?

3. What has become of that immense volume of water that stood so high over the whole earth?

4. What is the next objection?

5. What is to be deduced from this?

6. What may be remarked on basaltic rocks on the summit of lofty mountains?

7. How is basalt found?

8. Might not the rapidity of the returning ocean have carried with it most of the newly-formed basalt?

9. How would this agree with the position of basalt generally?

10. Would this remove the objections to this theory?

11. But are they not now considered of volcanic origin?

PLUTONIAN OR HUTTONIAN SYSTEM.

1. The Huttonian system does not carry us back to the original formation of the globe; but Dr. Hutton supposes that the present dry land was once the bed of the ocean.

2. The strata were not precipitated from any chemical solution; but composed of the elements of other bodies, that must have been destroyed before the formation of the present continents.

3. The ruins of a former world are not traceable in every piece of rock: but they are so generally diffused as to leave no doubt that all the strata were formed from the materials of continents that existed previously.

4. The materials have been originally carried into the sea, by the same causes which are now wearing down our present continents in every part of the globe.

5. Dr. Hutton observes that every continent or island has two extremities, the mountain summit and the sea-shore — on the former there is no increase, but a constant decay.

6. The rocks are split into fragments by the agency of heat, frost, and moisture; these fragments are removed by rain and torrents in gradual

succession from the highest to the lowest station, and are farther broken in their descent.

7. The fragments of rocks having reached the shore, they are dashed by the returning tides upon the coast, and serve as instruments of destruction, aiding the violence of the waves in excavating and breaking down the solid ground.

8. The present dry land being constantly diminishing, in the same manner as the materials of former continents were carried to the ocean, and spread over its beds, in form of gravel, sand, mud, or impalpable sediment, will eventually become submerged in succession.

9. The above materials covered the remains of marine animals by successive depositions, forming distinct layers.

10. The layers formed from the fragments of former continents are supposed to have been consolidated by subterranean fire.

11. The subterranean fire by which rocks were formed, is supposed to exist in the central recesses of the globe, and to have periods of increased activity, by which certain parts of its surface are heated and consolidated.

12. Dr. Hutton affirms, that the fire acting with great intensity on the internal parts of the globe, the materials which form the mountain granite became in a state of perfect igneous fluid-

ity, and the fluid mass continuing to expand, raised up the incumbent strata from the watery abyss, and former continents were thus inundated or sunk down.

1. Does this system comprise the formation of the globe?

2. How were the strata formed?

3. Are the ruins of another world visible in any of the existing strata?

4. What is to be further observed?

5. What does Hutton remark on the general dilapidation of continents?

6. How does this take place?

7. What is the next process of dilapidation?

8. What is to be deduced from this?

9. What did those form?

10. How were the strata formed from these materials?

11. From whence was this heat procured?

12. What does Dr. Hutton advance as to the destruction of former continents?

NEW CONTINENTS.

1. The new continents emerged from the abyss were devoid of all vegetation; but time producing terrestrial plants and animals, the new continents assumed the verdure of those submerged continents.

2. The new continents began to be wasted, like the old; valleys were excavated in the softer beds by rain and water-courses, and the foaming ocean commenced its attacks on the coasts.

3. The materials thus wasted, and washed to the ocean, form the basis of strata for future continents, to be raised from the ocean by the same causes.

1. What was the supposed appearance of the new continents?

2. What process then took place, to the destruction and diminution of the new continents.

3. What will this waste eventually produce?

PROFESSOR PLAYFAIR'S REMARKS.

1. Professor Playfair considers them a series of great natural revolutions in the condition of the earth's surface, of which we see neither the beginning nor the end.

2. The successive and endless changes which daily take place accord well with what is known of the economy of the world.

3. Professor Playfair observes that we discern neither beginning nor end of the different species of animals and vegetables that inhabit the earth.

4. Professor Playfair observes, that in the planetary motions, where geometry has carried the eye so far, both as to the past and future, no marks are discernible either of a commencement or a termination of the present order; indeed he conceives it impossible that such marks should exist.

5. Professor Playfair remarks, that the Author of nature has not given laws to the universe which, like the constitution of men, carry in themselves the elements of their own destruction.

6. He observes, that the Almighty has not permitted in his works any symptoms of infancy or old age, or any sign by which we may estimate either their future or past duration.

7. Playfair states, that the Author of the universe can put an end to all things at some determinate period, as he no doubt gave a beginning to the present system.

He assures us, that this great catastrophe, the close of all existing harmony, cannot be brought about by any existing laws, nor is the end evitable by anything which we perceive.

1. What does Professor Playfair remark on the succession of continents?

2. Does this accord with what is known of the earth's economy?

3. What does he observe on the succession of animals?

4. What comparison does he draw as to the uniformity

of planetary motions, to confirm this opinion as to our earth ?

5. What comparison does he draw as to the constitution of man and the laws of the universe ?

6. What does he farther remark ?

7. What are the remarks of Professor Playfair as to the duration of all things ?

8. How does he suppose the end to be effected ?

HUTTONIAN OPINIONS AS TO GRANITE.

1. Werner supposes granite to be a primitive rock, whilst Dr. Hutton supposes it of a more recent formation than its incumbent strata.

2. To support this theory, Dr. Hutton supposes granite to have been erupted from great depths in a state of igneous fusion, bursting through the strata in some parts, and upheaving the whole from their submarine situation.

3. Dr. Hutton conceives the original fluidity of granite to be evinced by its crystalline structure.

4. Dr. Hutton supposes the fluidity was not that of the elements taken separately, but of the whole mass.

5. The perfect consolidation of granite is the best proof of its having been rendered fluid by heat ; for, had it crystallized from an aqueous

solution, there would be found interstices between the crystals.

6. The veins of granite which often shoot into the incumbent schistus, are proofs that the granite must have been in a fluid state, and that the whole mass was also fluid at the same time.

7. Subterranean heat could only effect this purpose, and this impelled the melted matter against the incumbent beds with such force, as to raise them from their places, and assign them that highly inclined position, in which they are still supported by the granite, after its fluidity ceased.

1. Do not Dr. Hutton and Werner differ as to the formation of granite?

2. What does Hutton advance to support this supposition?

3. What is advanced to prove the igneous fluidity of granite?

4. Does he suppose the fluidity to have been in its component parts?

5. What is the greatest proof of its having been rendered fluid by heat, and not a crystalline precipitate, as advanced by Werner?

6. What other proof is offered to confirm the fluidity to have been effected by heat?

7. Where was the seat of this heat?

PROFESSOR PLAYFAIR.

1. Playfair considers the proof of the igneous origin of granite veins sufficient to establish the same agency to be the origin of all mineral substances.

2. Rocks, whether stratified or unstratified, owe their consolidation to the same cause, though acting with different degrees of energy.

3. The stratified layers of rocks, says Professor Playfair, have been in general only softened; whereas the unstratified have been reduced to a state of perfect fusion.

4. In this general conclusion we see two parts; the first containing two propositions, either that the fluidity, which preceded the consolidation, was simple, namely, that it did not arise from the combination of those substances with any solvent.

5. The next conclusion is, that after consolidation those layers of strata have been raised up by an expansive power acting from below, and have by that means been brought into their present position.

6. The evidence of subterranean heat is proved by the phenomena of hot springs, volcanoes, and earthquakes.

7. The existence of hot springs, volcanoes, and earthquakes, not only proves the existence of subterranean heat, but confirms the opinion of a moving and expansive power within the earth.

8. That heat was the cause of the fluidity and subsequent elevation of mineral bodies is a matter of theory; but the *cause* assigned is sufficient for the *effect*, and the same is not true with respect to any other stated cause.

9. At the same time that granite was in this state of fusion, it was ejected amongst the strata already consolidated; it, by its expansive power, heaved them up, and filled up the cavities thus formed as if in a mould, and the unmelted strata restrained the igneous fluid to certain bounds.

10. The incumbent strata, thus heaved up by the granite in a state of fusion, was burst asunder at the summit, shewing only a small portion, whilst the lower parts became gradually solid, and retained the incumbent strata on beds of schist, in their present inclined or vertical position.

1. What has Professor Playfair advanced on this head?

2. What does he remark on the stratified rocks?

3. What is the difference between the consolidation of stratified and unstratified rock?

4. What is deducible from this?

5. What is the second proposition in the above conclusion?

6. What evidence have we of subterranean heat?
7. What do they also prove?
8. Is not this a matter of theory?
9. Why did not granite in a state of fusion form horizontal beds?
10. What was the effect on the incumbent strata?

MINERAL VEINS.

1. Mineral and metallic veins, that intersect rocks and strata, are supposed by the Plutonists to have been cracks or fissures, originally formed by subterranean heat.

2. The veins were filled with their contents by melted matter ejected from beneath.

3. In some instances the matter was sublimed in the form of vapour, which condensed and crystallized on the sides of metallic veins.

4. Mineral veins are generally filled with either granite, porphyry, green stone, or basalt: these are often of vast extent, traversing a whole country.

5. The contents of veins are frequently harder than the rocks they intersect, and remain undecomposed after the surrounding rocks have perished, rising like a wall above the surface.

6. In the north of England those ridges are called *dykes*, a term synonymous with wall: these

dykes produce great changes in the portion of strata they intersect.

7. The basaltic dykes bear the most visible marks of their igneous origin, and in appearance and composition have a near resemblance to many volcanic lavas.

8. The changes produced on the rocks which basaltic dykes pass through, are such as may result from contact with substances in a state of fusion.

9. Basaltic rocks often exist in countries far distant from any active volcanoes.

10. The existence of basaltic rocks, where no active volcanoes exist, clearly proves that subterranean heat has been an important agent in the formation of our present continents.

11. The transition which may frequently be traced from granite to sienite, green stone and basalt, leads to the conclusion that they had all the same origin.

12. The difference between stratified and unstratified rocks consists in the latter being perfectly fused, and the former only softened by subterranean heat.

13. The farther the strata were removed from granite the less they were acted upon by central heat, and were left in a more earthy state.

14. Such strata as were easily fusible became

more crystalline than other strata in a similar situation; but composed of refractory materials.

15. The strata whilst in a soft state were subjected to two forces; the one by the pressure of the superincumbent rocks; the other from the partial depression or elevation of the earth's surface in their vicinity.

16. The pressure of the incumbent rocks, and the lateral pressure, acting nearly at right angles to each other, produced those contortions of the strata so visible in schistose rocks adjoining the granite.

1. What is to be remarked of mineral veins traversing rocks?

2. How were they filled?

3. Is there not another cause?

4. What substances are generally found in veins, besides ores and metals?

5. Is not the matter contained in veins more durable than the rocks intersected.

6. What are those walls called?

7. When the dykes are basaltic, what marks do they bear?

8. What appearance do they leave on the rocks they pass through?

9. Do not those rocks exist remote from active volcanoes?

10. What does this tend to prove?

11. What is the general transition?

12. What is further to be observed on stratified and unstratified rocks?

13. What effect was produced on the more remote rocks from subterranean heat?

14. Were not some of the distant strata sensibly affected by subterranean heat?

15. To what forces were soft strata subjected?

16. What was the result of those two pressures?

DR. HUTTON'S IMPROVEMENTS ON THE THEORY OF FORMER PLUTONISTS.

1. Dr. Hutton clearly proves the aid which his system derives from compression, and its powerful agency in the formation of our present strata.

2. Dr. Hutton proves that limestone, when not deprived of its carbonic acid, cannot be reduced to quicklime, and that its caustic state depends entirely on its being divested of its carbonic acid by heat.

3. The earth being under the pressure of the ocean prevented the escape of the carbonic acid, and being thus confined tended to render the lime fusible.

4. When the limestone, with its undiminished portion of carbonic acid, was suffered to cool, after the action of subterranean fire, it acquired its crystalline texture.

5. The conjecture of Dr. Hutton was regarded as an assumed hypothesis, to remove a difficulty from the Plutonian system.

6. Sir James Hall proved its accordance with nature, by a series of ingenious and decisive experiments.

7. Sir James Hall confined powdered chalk in a gun barrel so closely as to prevent the escape of the carbonic acid.

8. The musket-barrel, containing the powdered chalk was then subjected to the heat of a furnace, by which it was fused and consolidated, and converted into a substance resembling crystalline marble.

9. The experiments clearly proved that an aqueous pressure of 32 atmospheres or 1700 feet of sea is capable of forming a limestone in a proper heat.

10. Sir James Hall found that under 86 atmospheres, or 3000 feet, a complete marble may be formed.

11. The carbonate of lime, with an aqueous pressure of 173 atmospheres, or 5700 feet, or little more than a mile of sea over it, gave complete fusion to carbonate of lime.

12. The heat and high pressure had a powerful effect on other earths, without reducing them to fusion.

13. Sir James Hall has proved, by ingenious experiments, that compression and the different circumstances under which mineral bodies become consolidated after fusion greatly modify their state, and sometimes changes entirely their external appearances.

14. Basalt and lava, when melted and rapidly cooled, were found converted into a black glass; but, if cooled slowly, they acquired a texture resembling the original stone.

1. What improvements were added to the Plutonian theory?

2. What reason is assigned for the non-reduction of limestone into quicklime by this intense subterranean heat?

3. What prevented the escape of the carbonic acid, when exposed to intense subterranean heat?

4. What was the effect on the limestone, when the cause of heat ceased?

5. What was this assertion regarded as?

6. Who first placed this beyond doubt by experiments?

7. What was the most conclusive?

8. Having confined the chalk, what was his next process?

9. Did not Sir James Hall prove by experiments pressure to be indispensable in preventing the escape of carbonic acid?

10. What pressure did he find necessary to produce marble?

11. At what pressure did the carbonate of lime undergo complete fusion?

12. What effect had the heat and pressure on other earths?

13. What else has Sir James Hall given to support the igneous system?

14. What did he adduce as a strong proof?

SOURCES OF HEAT SITUATED AT GREAT DEPTHS.

1. The extent to which volcanic fires are operative, prove that the sources of heat are situated at great depths.

2. By soundings taken in the ocean during some of the eruptions of Etna, the water is considerably heated at a great distance from Sicily.

3. Near the island of Volcano, the sea is in a boiling state, and the black sand on the shore is so hot that it cannot be held in the hand.

4. It is affirmed by supporters of the igneous origin of strata, that the volcanoes in the Lipari islands have some communication with Etna and Vesuvius.

5. The enormous volcanoes of the Andes are of sufficient magnitude and power to produce considerable changes on the surface of the globe, and overwhelm whole provinces in a single night.

6. There are many extinct volcanoes, the craters

of which exceed in size those which are at present in a state of activity.

7. The lava from extinct volcanoes bears the nearest resemblance to primary rocks.

8. The ancient lavas were probably erupted from great depths, under a high pressure of the ocean, at the period when all the present continents were covered by water.

1. What is supposed to be the situation of volcanic fires?

2. What tends to prove this?

3. What is the state of the sea near the island of Volcano?

4. What is supposed as to an internal communication with volcanic fires?

5. What is observable of the Andes?

6. Are there not many extinct volcanoes?

7. What is the nature of the lava of those craters?

8. When were they supposed to have been erupted?

USES OF VOLCANOES IN THE ECONOMY OF NATURE.

1. From the number and extent of active and extinct volcanoes we may be led to infer that they have an important office to perform in the economy of nature.

2. A volcanoe may be considered as a spiracle or chimney to the subterranean surface, in order

to prevent the unnecessary elevation of land, and the fatal effects of earthquakes.

1. What does Dr. Hutton observe of volcanoes?
2. In what manner may they be regarded as useful or necessary?

DIFFERENCE BETWEEN COMBUSTION AND IGNITION.

1. Dr. Hutton observes that most bodies exposed to heat, in contact with atmospheric air, undergo a chemical change.

2. Bodies, thus exposed, have their more volatile parts driven off, and the inflammable parts combine with oxygen.

3. Bodies under pressure, without the access of atmospheric air, may be exposed to the highest degrees of heat, without undergoing any change but that of simple fusion,

4. Bodies, when acted upon by heat in atmospheric air, undergo a change by combustion; but, when deprived of that action, the volatile parts are retained, and the only change effected by heat is that of simple fusion.

1. What does Dr. Hutton in his theory observe on combustion and ignition?

2. What is that charge?

3. What is the effect when under pressure, and confined from the action of the atmosphere?

4. What is to be deduced from this conclusion?

AGES OF CONTINENTS.

1. Dr. Hutton considers it beyond doubt from many existing circumstances, that the present continents emerged from the ocean, by igneous agency at different periods of time.

2. According to the Huttonian theory, the American continents are of more recent origin than those of Asia or Africa.

3. The newest continents have more numerous appearances of volcanic fire, and are more agitated by internal convulsions and earthquakes than the old continents.

4. Africa is so tranquil that its volcanoes may be considered nearly exhausted; so also is Asia when compared to South America.

5. The secondary strata are already carried away in many parts; and the primary mountains by their decomposition are covering with silicious sand, and a great portion of the interior of Africa is thus rendered no longer habitable.

6. The newer continents may probably survive the first emerged.

1. Did the existing continents emerge from the ocean at the same time?

2. Which does he range as the newest continents?

3. What is to be expected of the newest continents?

4. Is this the case by observation?

5. What is most remarkable in Africa?

6. May not the disappearance of continents take place according to seniority?

SITES OF FUTURE CONTINENTS.

1. When the present continents shall become submerged, the Indian and Pacific Oceans may become the sites of future continents.

2. The elevation of extensive continents from the bed of the ocean may require ages for its completion.

3. Before rocks and strata attain their permanent level above the ocean, they may be subjected to be covered again by the sea, and receive fresh deposits of sand, which will be formed into stone by heat, at their second elevation, and thus a succession of continents could continue for ever.

4. Fire and water may both be regarded as important agents in the consolidation of different rocks; of the former we have instances in beds of compact lava, and of the latter in the recent formation of some sandstones.

5. The united efforts of both are seen in the indurated argillaceous beds emptied, in the state of mud, from the volcanoes of the Andes.

1. What are the supposed sites of future continents?

2. Will this be gradual, or otherwise?

3. Will they at once obtain a permanent level above the ocean?

4. What conclusions must be drawn, as to the consolidation of rocks?

5. Where are the united efforts of both most conspicuous?

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